Report on the First Season of Excavation of an Unidentified Shipwreck at Point Cloates Western Australia

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Introduction

At the time of writing this report, I have known of the existence of the wreck at Ningaloo for less than a year.

The site has yet to be identified and the excavation has not been completed. Given further consideration my views on some aspects discussed below may well change. Nevertheless, I feel that all who have been involved with the work at any particular time will be interested to know of the progress that has occurred to date.

Acknowledgements

Our hosts at Ningaloo; Edgar, Billie and Jane Lefroy, made everyone most welcome, and helped us in many ways.

A large number of people assisted voluntarily in the field. I have to thank Ian Anderson, Graeme and Sue Anderton, Cynthia Baker, Mal Bennett, Graham Cowley, John Cresswell, Garry Edwards, George Green, Conrad Groen, Jim Henderson, Kandy Hodgson, Peel Howden, Murray Hunt, Helen Kimpton, Caroline Maizey, Wally Marshall, Peter and Qui ta Martinson, Joy McCarthy, Russell Miners, John Moffat, Mary North, Karen Paterson, Jackie Paxman, George Petersons, Dr. Paul Prociv, Bob Scott, Dr. Martin Sher, Jill Stephenson, Gary Sutton, and Graeme Townsend.

I am grateful to Brian Stagg, Ken Todd and Rod Wright for their help both in the field and back in Perth.

Glynn Dromey, Larry Paterson, Barry and Frank Paxman, all worked with the Museum during the expedition. Their assistance and patience has been invaluable to the work.

I am also grateful to Doug Bathgate, Sgt. Sandy Reid, Duke Wellington, and Bill Fleay of Harbours and Rivers, for their help in the field.

Film-makers John Collis, John Cunningham, Hugh Edwards, Stan Jeffries, Brian Rogers, Pedro Santafe and Neil Trudgeon helped in their capacity.

I thank all the staff members from the departments of Maritime Archaeology and Dr. Neil North's staff in Materials Conservation who have provided their skills and labour in the field and the laboratory. Several of these people, (in particular Scott Sledge, Dr. Ian McLeod and Mike McCarthy) initiated overseas correspondence with valuable results. Pat Baker prepared the plan from the photomosaic. Stan Wilson also contributed his numismatic knowledge. John Bannister, (Director of the Museum) Dr. Ian Crawford (Head of the Division of Human Studies) and Robin Reid (Executive Officer) enabled us to get the show on the road to Ningaloo in miraculously short time despite the fact that the expedition had not been budgetted for.

Dr. Frank Broeze advised on aspects of East India Trade. John Patterson followed up archival leads in the Battye Library. Michael Lorimer assisted in the preparation of maps. Many others have given help at various stages of the project.

Contents

1. Discovery

The wreck site was found in 1978 by a spearfishing group, consisting of Glynn Dromey, Larry Paterson, Frank Paxman and Barry Paxman. The discovery was reported to the Federal Government in accordance with the Historic Shipwrecks Act of 1976, and Gazetted as an Historic Shipwreck on 14th December 1978. A collection of material which had been raised by the finders was passed on to the Western Australian Museum on 27th October, 1978. This consisted of some 6000 Spanish silver coins, a number of copper hull fastenings, glass and ceramic fragments.

2. Inspection

Upon the Museum's acceptance of the material already raised, arrangements were immediately made for an expedition (2nd November to 9th November) to inspect the site. Museum staff were accompanied by finders Frank and Barry Paxman, and Larry Paterson.

The wreck was found to be situated south of Point Cloates on Ningaloo Station which is some 1100km north of Perth.

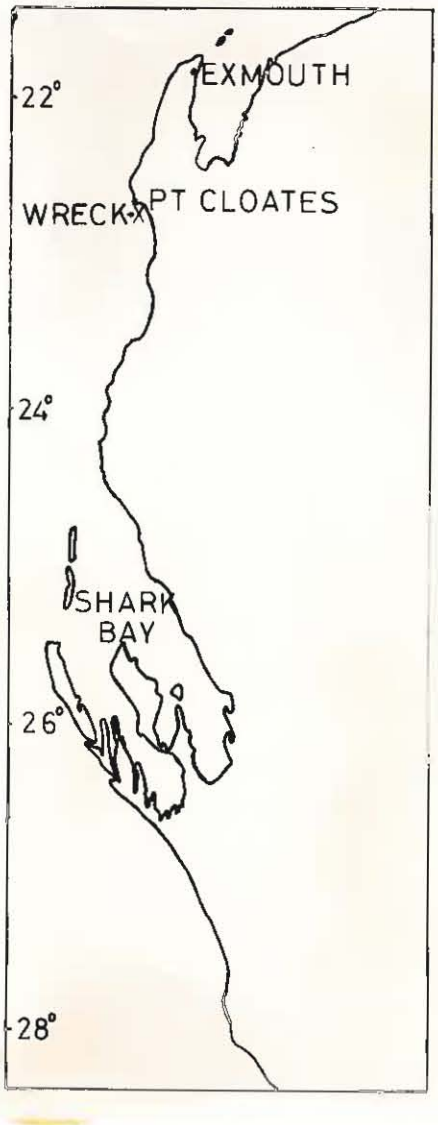

Fig. 1 The wreck lies at Point Cloates on Ningaloo Station

It lies in 5-6 metres of water on the leeward side of the offshore Ningaloo coral reef, close to an entrance through the reef. During the two diving days it was seen that the area is subject to strong south-westerlies which blow at most times. But despite the reduction of visibility and a certain amount of seabed surge in heavy weather, the diving on site was not interrupted by weather conditions.

The wreck lies on its port side with its bows facing W.S.W., half buried in sand on the edge of a gradually sloping coral/limestone reef. The 36 metre long site on inspection was dominated by a large central mound of ballast stones extending 25mx10m. Among the ballast three small cannons and three anchors could be seen. At the stern were a number of copper fastenings and sternpost fittings. A little forward was an area 4mx6m where a large number of silver coins overlaid hull structure. At the bow end the ship's bell, a lead hawse hole, and a copper pump tube were among the recognisable material

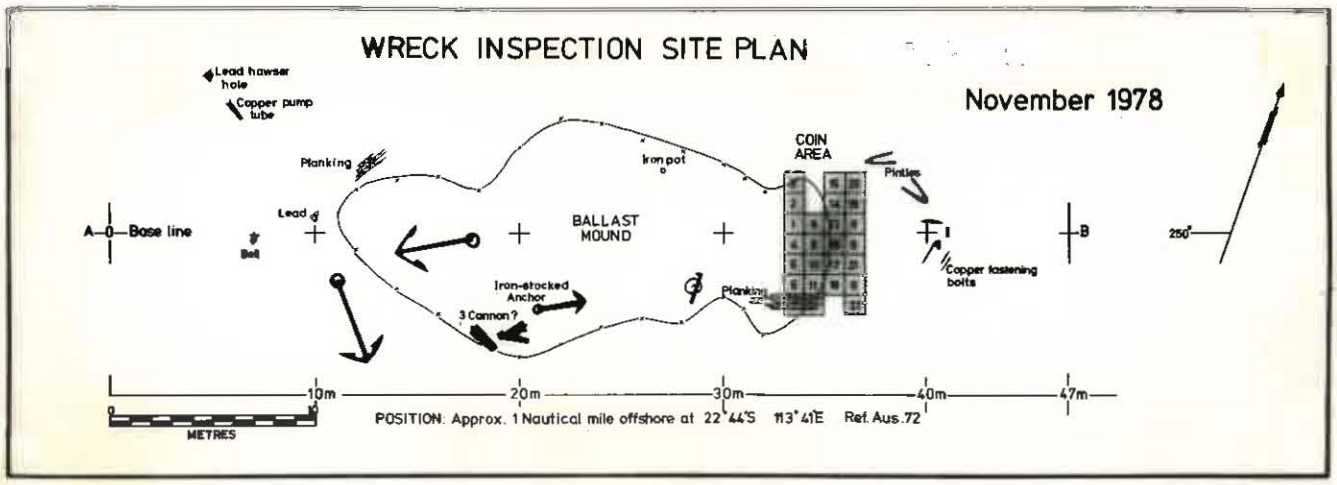

Fig. 2 A site plan was produced during the initial inspection

Samples raised for identification purposes included the ship's bell, a selection of European and Asiatic ceramic sherds, glassware, and a further 900 silver coins. The quantity and nature of material observed made it clear that a large scale excavation was warranted, and that there was a need to proceed with excavation without delay.

3. The First Season of Excavation: December 1978 - February 1979

3A - Aims :

Two principal aims were borne in mind at the commencement of the season of excavation. Firstly, it was intended to remove all the silver coins from the wreck to prevent its being an attraction to looters who might destroy the site. Secondly, it was hoped that the cargo, supplies and fittings of the vessel could be excavated leaving the surveyed hull timbers and the ballast on the seabed. The second aim was not fully achieved. Prior to excavation the sight of exposed wooden structure at several points on the wreck seemed to indicate a shallow layer of sand and artifacts over the wreck timbers. But excavation of the ballast area revealed a deep layer of material over the timbers, increasing the potential of the site but slowing progress.

3B - Logistics:

The two most important logistics problems were distance and isolation. The 9.5m workboat Beagle together with the rest of the expedition plant was placed on board a low loader for the 1000km journey by road to Carnarvon, the nearest port to the site.

Fig. 3. Beagle is loaded on to a semi-trailer for the journey to Carnarvon. Photo Pat Baker.

Then the vessel had to be sailed 160 miles (260km) to Point Cloates where a mooring was established for the season. Personnel and equipment came by road in Museum vehicles from Carnarvon to Ningaloo Station

Another major consideration was that the excavation (15th December to 15th February) was during the cyclone season, thus presenting a potential hazard for a small workboat 160 miles from a port. Prawn trawlers have used Point Cloates as an anchorage during cyclones, but it was planned that if a cyclone was forecast, the Beagle would make use of its speed and sail to Carnarvon for shelter. Communications were maintained twice daily with Perth and the Zuytdorp Station on the Beagle's radio. A pair of two-ways assisted in communication during the day between the boat on site and the shore camp.

The nature of the work necessitated the constant use of an air-lift compressor on the Beagle. To sit comfortably on the vessel during an extended season in relatively open waters the compressor had to be more compact than the hire units normally available. For this reason, a unit was specially built for the job. This consisted of a 20hp Kawasaki petrol engine powering a 50cfm compressor mounted on a tubular base which acted as a reservoir.

Fig. 4 The airlift compressor fits snugly on the deck of Beagle
Photo Pat Baker

Shallow water between the anchorage and the wreck site was also a problem. Leaving the anchorage for the wreck site the Beagle had to thread its way through some two miles of sand banks, and a further mile of water dotted with coral lumps which rose to one metre from the surface. This meant slow going on the sand bars at low tide as the Beagle 'ploughed' its way across, and a bow watch was maintained over the coral areas. The shallow water also presented problems in transporting heavy items such as cannons ashore.

Fig 5 Beagle towing a cannon through the shallows. Photo Pat Baker

Accommodation proved to be no problem as the shearing shed of Ningaloo Station was made available for the duration of the season. Access was also given to shower and toilets, and several of the shearers' quarters. Water, always in short supply on Ningaloo Station, was brought from Exmouth by Mr. Doug Bathgate in his truck.

Fig. 6 The shearing shed is situated next to the most sheltered anchorage in the area. Photo Pat Baker

3C - Personnel:

The sheltered position of the site meant that diving could continue throughout the day, despite strong southerlies. This in turn meant that a large team was required on site. As well, the isolation of the Station dictated that field registration, equipment maintenance, conservation and photographic processing be carried out at the camp. Adding to this the frequent presence of two television film crews, the number of people on the expedition at any one time varied from 7 to 25, volunteers forming a majority.

Fig 7 Distribution plan showing copper stern fittings. Plan by Michael Lorimer

3D - Summary of Activities:

8 December: A premature news release led to need for a watch-keeper on site.

9 December: Scott Sledge and Murray Hunt drove to Ningaloo with dinghy.

16 December: The Beagle arrived at Ningaloo from Carnarvon by sea. A three vehicle convoy ferried equipment by road from Carnarvon to Ningaloo.

17 December: A star picket grid network was laid out on the wreck for survey purposes. An in-shore mooring was established for the Beagle.

18 December: Two airlifts were set up on site. The first two 2 - metre grids were completed.

18 - 21 December: Work was done on grids 3 - 5. Stern fittings were found. Progress was slowed by the depth of the deposits (up to 1 m).

22 December: The first timber structure was revealed.

23 December: Work on grid 6 revealed copper nails and 250 coins.

24 - 25 December: No diving (Christmas).

26 - 27 December: The inshore mooring was bolstered with more chain.

28 December: - 2 January: Airlifting, the removal of ballast stones from the wreck, and site survey work continued concurrently.

3 January: 2500 coins, and a jug shard stamped 'BOSTON' were raised.

4 - 6 January: Winds were up to 30 knots and accompanied by large swell. The on-site mooring was strengthened to cope.

7 - 10 January: Airlifting, removal of ballast, and survey. Parts of a clock found.

11 January: The first carronade was raised from the site.

12 - 15 January: Airlifting, removal of ballast, survey. Progress up to grid 9.

16 January: On-site work was interrupted to answer an emergency call. Beagle rescued the 45 foot fishing boat Galano disabled outside the reef close to the SS Perth wreck.

17 - 18 January: Airlifting, removal of ballast, survey. The base of the capstan and a quantity of chain were raised.

19 January: Personnel accompanied Duke Wellington to examine land sites possibly associated with the wreck. Copp nails were seen in the dunes.

20 - 26 January: Airlifting, ballast removal, timbers survey.

27 January: The Beagle's starter motor was repaired. In the afternoon a second cannon was raised from the site.

28 January: A third cannon was raised, and left at the inshore anchorage along with the ship's oven.

29 - 30 January: Surveyed areas were covered with ballast as unsurveyed areas were uncovered. Airlifting in grid 12.

31 January: A line search through the sand dunes on Point Cloates revealed ballast stones.

1 February: Surveyed areas were covered with ballast. The rudde was triangulated.

2 - 4 February: Equipment was removed from the site for return to Perth. Final surveying continued as the site was covered with ballast.

5 February: Beagle was sailed to Carnarvon to await transport to Perth.

7 February: The expedition left for Perth.

3E - Methodology On Site

(a) Diving Schedule

On site diving work was organised around a daily morning and afternoon shift. The morning shift (4-5 divers + tender) left the camp at 800 hours for the half hour voyage to the wreck site on the Beagle. Then the first diving shift commenced at 900 hours and lasted until 1230 hours. A dinghy, carrying the afternoon shift and lunch, arrived at the site at 1230 hours. At 1300 hours the morning divers returned to shore, while the afternoon shift lasted from 1300 hours to 1530 hours.

Fig. 8. A concussion tube devised by Bob Richards facilitated the positioning of survey pegs. Photo Pat Baker

Diving times sometimes varied for individuals depending on the tasks being performed. The ballast shifting work was very strenuous and several divers suffered from exhaustion during their first week of excavation. The 2 - shift system meant that work on site generally continued for 7-8hrs.per day. It also gave individuals the opportunity for other necessary activities, such as drawing, registration, field conservation, photographic processing, domestic chores, equipment maintenance and leisure. The system enabled a lot of work to be done but required a large team of divers.

(b) Exposing the Wreck

The first task on the wreck site was to establish a survey reference system. Using triangulation methods 4 star pickets were hammered into the seabed to form a rectangle 48 metres x 16 metres, which enclosed the wreck site.

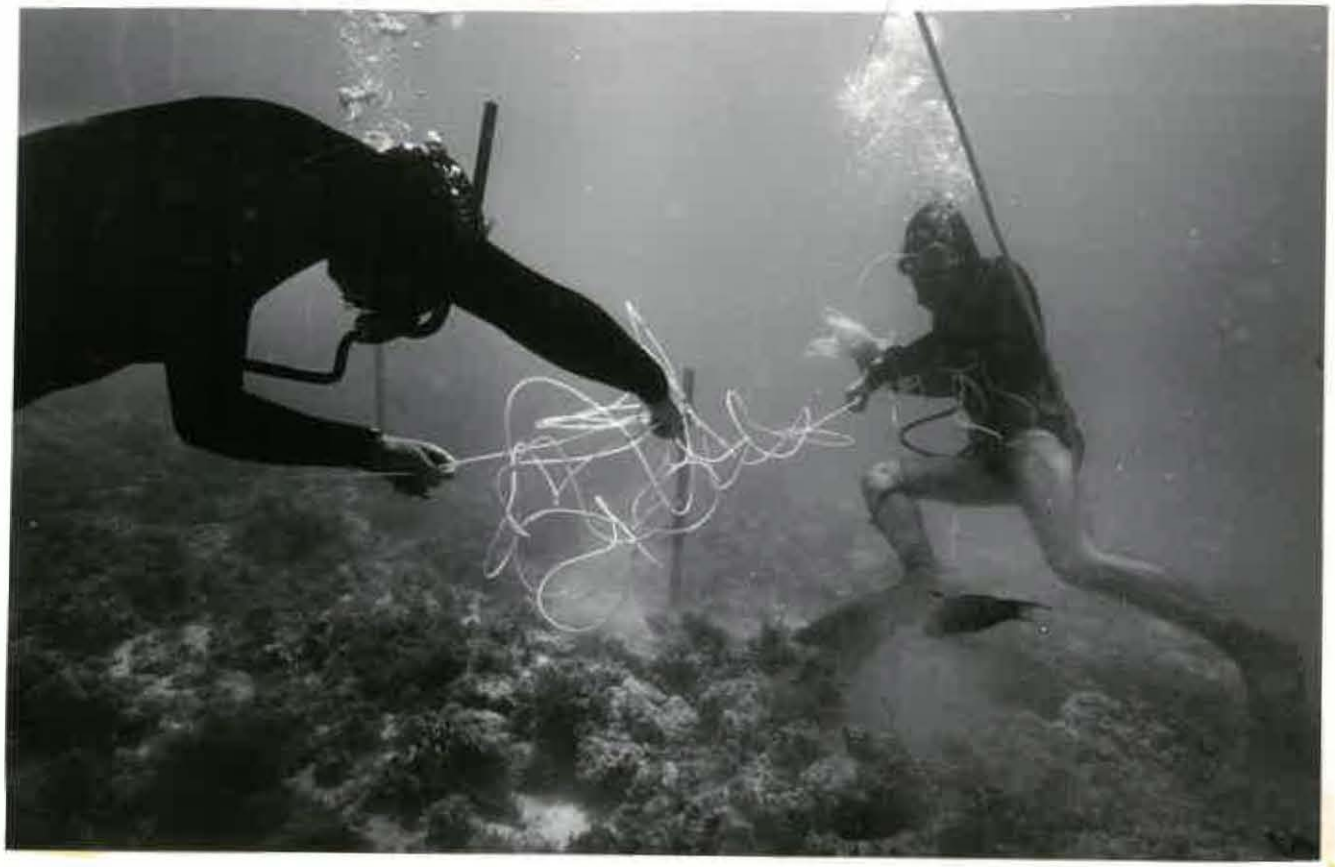

Fig. 9 Divers lay out the survey lines. Photo Pat Baker

Along each of the 48 metre sides, star pickets were placed at 2 metre intervals, making 24 strips across the site. A survey line was then placed around the first grid strip, incorporating the 46-48 metre section of the wreck.

A 3 inch airlift was then set up. In order that the airlift could be as manouverable as possible (to cover strips 16m x 2m) a small diameter, relatively short pipe was used, and given a light weight anchor at the mouth end, and an easily shifted anchor on the spoil end. Once this was in operation on the 46-48 metre strip, a second airlift was put into operation on the 44-46 metre strip, and the two strips were excavated concurrently. The airlift spoil was initially directed to either side of the wreck, but as work proceeded towards the bow of the ship the spoil was used to back-fill areas where recording had been completed.

Fig 10. Divers airlifting across two adjoining grids. Photo Pat Baker

The depth of deposit over the ship's timber structure varied up to 1.5 metres in depth and consisted of sand and small (up to plate sized) pieces of dead coral. In some places the sand did not cover the coral reef at all.

In the midships area the wooden structure was covered by a mound of ballast stones up to 1.2 metres in depth.

These had to be removed to expose the timbers for recording. The system of removal involved rectangular plastic baskets (c1m x 0.5m x 0.5m) which were filled with stones to weigh c3cwt. A plastic water barrel (c20 gallon capacity) was inverted and tied by its ears to the basket. The lid was cut out of the barrel, and diver's demand valves used to fill it with air. This did not lift the basket but did make it a comfortable load for two divers to carry from the site.

Fig 11. The ballast removal system. Photo Pat Baker

At the spoil heap the barrel was tipped over, releasing the air, and the basket inverted to spill the stones. The two items were then taken back to the site for a fresh load.

By this means it is estimated that approximately 100 tonnes of stone was removed from the site during the season.

The stone was lightly concreted together with coralline material. Where iron objects from the wreck were present a much harder encrustation was encountered and extra precautions had to be taken to avoid damage to the concealed iron objects.

c) Recording Timber Structure

As the airlifting progressed it became obvious that the vessel was lying on its port side. The stern timbers had disintegrated but the keel and the port side timbers had survived in good condition. The survey of the timbers was carried out principally by photographic means. Photomosaic runs were taken of each of the 2m x 16m grid strips in which timbers were present.

A number of tagged reference points appearing on these photomosaic runs were triangulated to assist in obtaining a constant scale when the photographs were put together firstly as grid strip runs, and then secondly as an overall coverage of the timber structure exposed.

The timbers site plan was then drawn from this photomosaic.

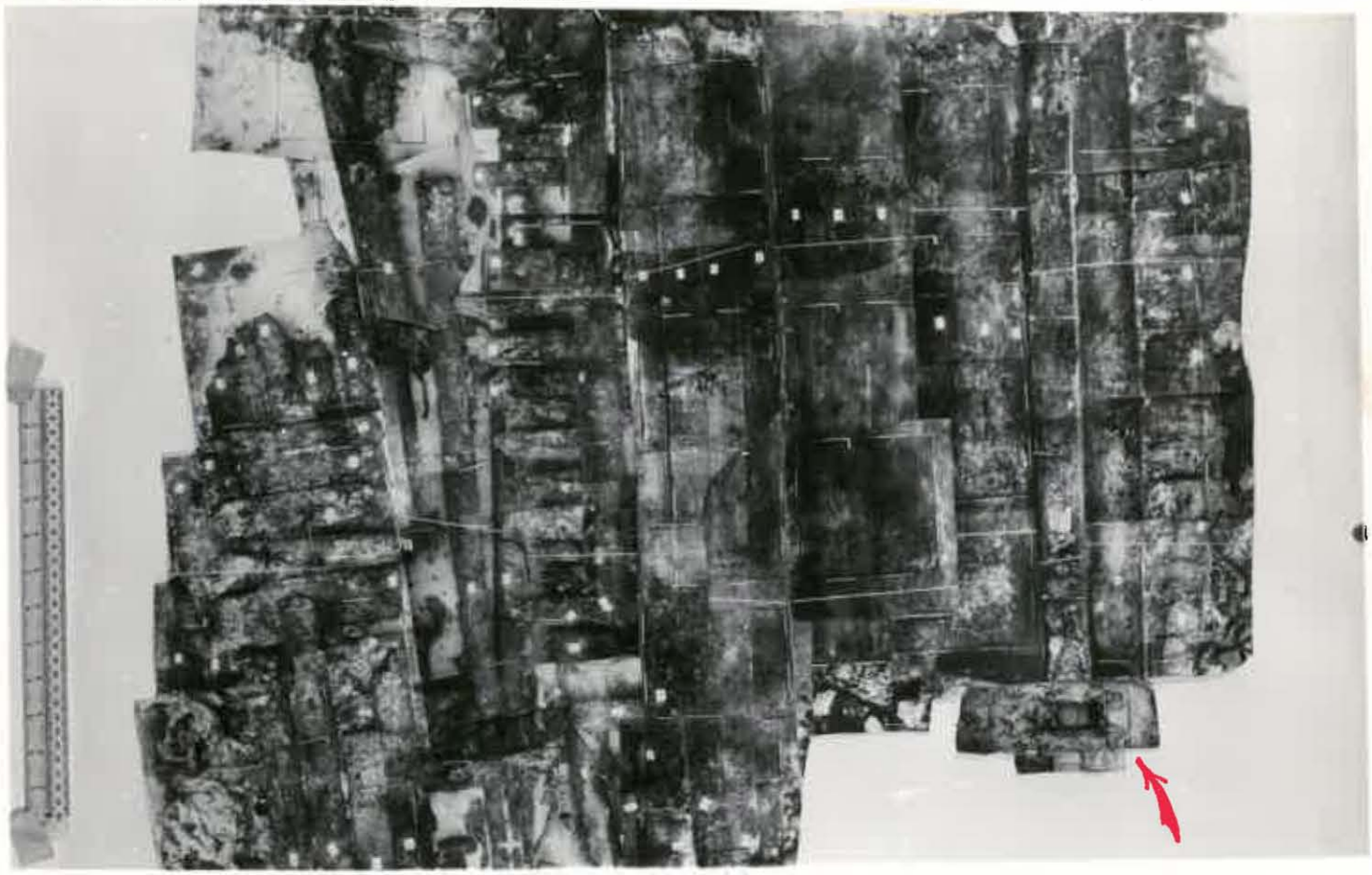

Fig 12. A section of the photomosaic. The arrow points to the mast step and keelson

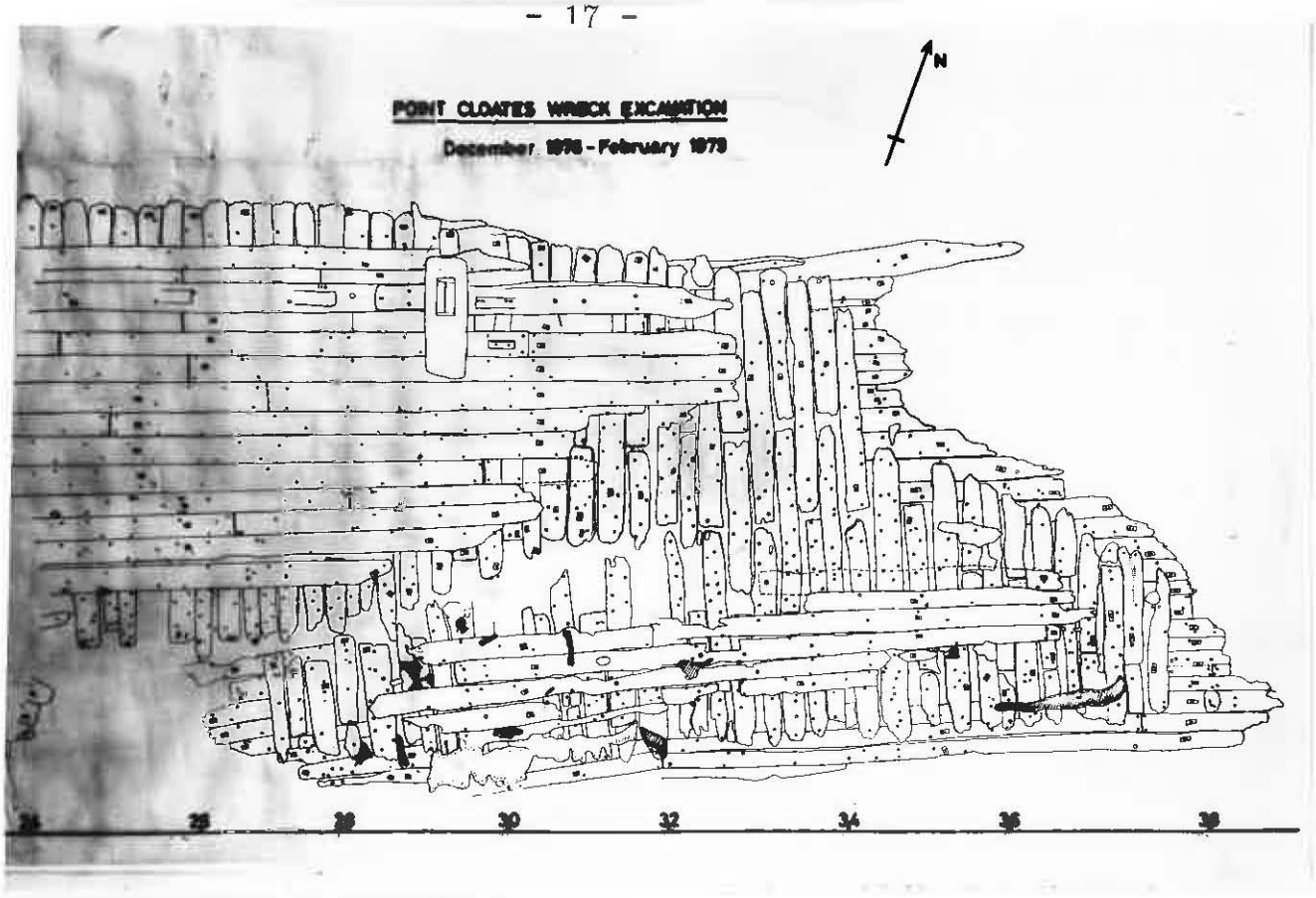

Fig 13. Plan of the stern section of the ship which was cleared

d) Recording Loose Items within the Structure

Tapes were laid along the two 16m sides of the 2m x 16m strip being excavated. One diver carried a drawing slate on which the grid strip had been laid out. As the diver operating the air lift exposed material the recording diver plotted the objects on the slate and then placed them in plastic bags according to type.

Fig 14. A diver records coin positions on a distribution sheet. Photo Pat Baker

Once ashore the material was registered according to the grid strip number.

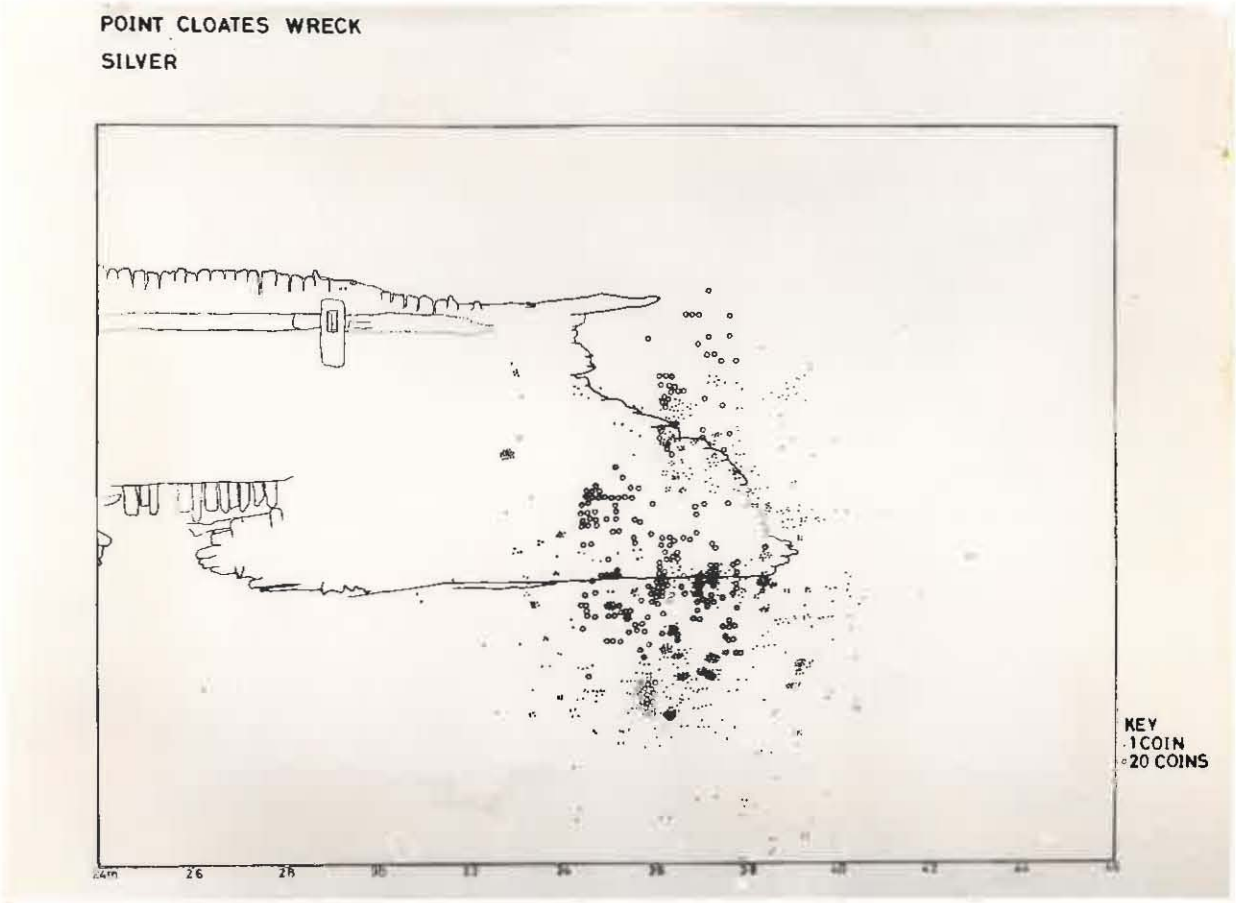

Fig 15. The distribution of coins. Plan by Michael Lorimer

Working on the seabed the recording diver was faced with a large number and variety of objects to be plotted, so a system of symbols, for example I = iron, was adopted.

e) The Raising of Small and Large Objects

Small objects were placed in plastic bags which were raised by hand in a large rectangular plastic basket. Small but heavy objects, such as the copper base of the capstan, were lifted using the water barrel filled with air, and then taken on board the Beagle.

The lifting of larger heavy items was complicated. The Beagle has no lifting gear so such items were towed to the inshore anchorage. The shallow water en route made it impossible to use lifting bags for the towing, so large items such as the cannons and the oven were lifted using 200 litre fuel drums. Even so, the cannons touched bottom several times en route and one had to be re-tied closer to the surface. The oven, which was lifted on a pallet base, was damaged when it struck bottom not far from the site More sophisticated equipment will be used for lifting the remaining heavy anchors and cannons.

Fig. 16. A cannon is raised complete with its protective concretion Photo - Pat Baker

3F - Methodology On Land

(a) Survey Procedures

Little time was available for carrying out surveys in the coastal dunes. A mast hoop was inspected on the shore some 15 miles south but it is not likely that fitting would have come from the wreck site.

Fig 17. Mast hoop with boom fitting near Coral Bay. Photo Pat Baker

On the south side of Point Cloates at a place called the 1 mile beach, a collection of copper nails (identical in shape to those found on the wreck), glass bottle fragments and iron fragments was seen. This would indicate that planking from the wreck came ashore in that area. Closer to the Point itself a line search, consisting of 15 walkers some 10 metres abreast walked along several kilometres of the dunes, observing a number of round stones similar in appearance to the ballast stones found on the wreck. The stones were in the context of Aboriginal camp sites exposed by the sand blow-outs, and may have been used for grinding purposes.

Fig. 18 Jane Lefroy briefs walkers prior to a line search. Photo - Pat Baker

On the north side of the Point an area was examined which in the past has yielded a collection of buttons. In the same area glass fragments from the early 20th century, iron fragments, and part of a fence were seen. The material may have originated from the Station, established in the 1890's, or the lighthouse, built around 1911.

Fig 19. Buttons found in the dunes. Photo Pat Baker

(b) Field Conservation and Registration

Two Conservators, often assisted by volunteers, took the baskets of material brought in by the divers each afternoon to a sorting table. Then the material was more fully sorted and concretions were removed. The material was then registered and packed either in solution or dry (depending on type) for transport to Perth. Coralline encrustations were carried out to sea and dumped.

Fig 20. Conservators deal with a day's finds. Photo Pat Baker

(c) Photographic Processing

One of the shearers' huts was used at night as a darkroom. This enabled the photographer to analyse his results daily and so to collect any missing information on site the following day.

(d) Artifact Drawing

The work of drawing the individual artifacts was continued throughout the excavation season, thus reducing the load back in Perth. Work was also done on drawing up distribution patterns of material raised each day as work on site progressed.

4. The Identification Question

The wreck is at present unidentified. The identification of post Western Australian settlement sites has generally proved to be a simple task, there being locally available either local newspaper articles or official correspondence which can be correlated with the position of a newly found site and the nature of the artifacts.

In the case of the wreck at Point Cloates, however, it is probable that the site is pre-Western Australian settlement. Thus there are no relevant archives in Western Australia. Before overseas archives can be methodically exploited it is necessary to know the approximate date of the wreck and the most likely origins of the vessel. For this it is necessary both to examine the artifacts from the site and any documentary background which may be relevant.

4A - Observations Regarding Artifacts

(a) Coins

Some 15,879 silver coins have been raised from the wreck and counted. The exact number cannot yet be given because some are fragmentary, and others are still concreted together but the total is probably close to 19,000. The cleaned coins range in date from 1766 to 1809. All but 11 of the cleaned identifiable coins are Spanish 8 reale pieces.

Fig 21. a) A Carlos IV coin with a circular punched hole
b) Reverse of a Mexico mint 8 real piece
c) A Fernando VII coin dated 1809

An analysis of 1900 identifiable coins showed a peak in numbers for the years 1802-04. Six coins have small circular holes punched in them. Most were Mexico mint, but others were from Lima, Potosi, Madrid, Santiago, Seville and Guatemala. They were struck during the reigns of Carlos III, Carlos IV and Fernando VII.

One of the Spanish coins was counterstamped with the head of the British monarch George III enclosed in an oval border. During a time when Britain was short of coinage the Bank of England had counterstruck large numbers of Spanish dollars in this manner and put them into circulation in Britain at 4/9d in value.

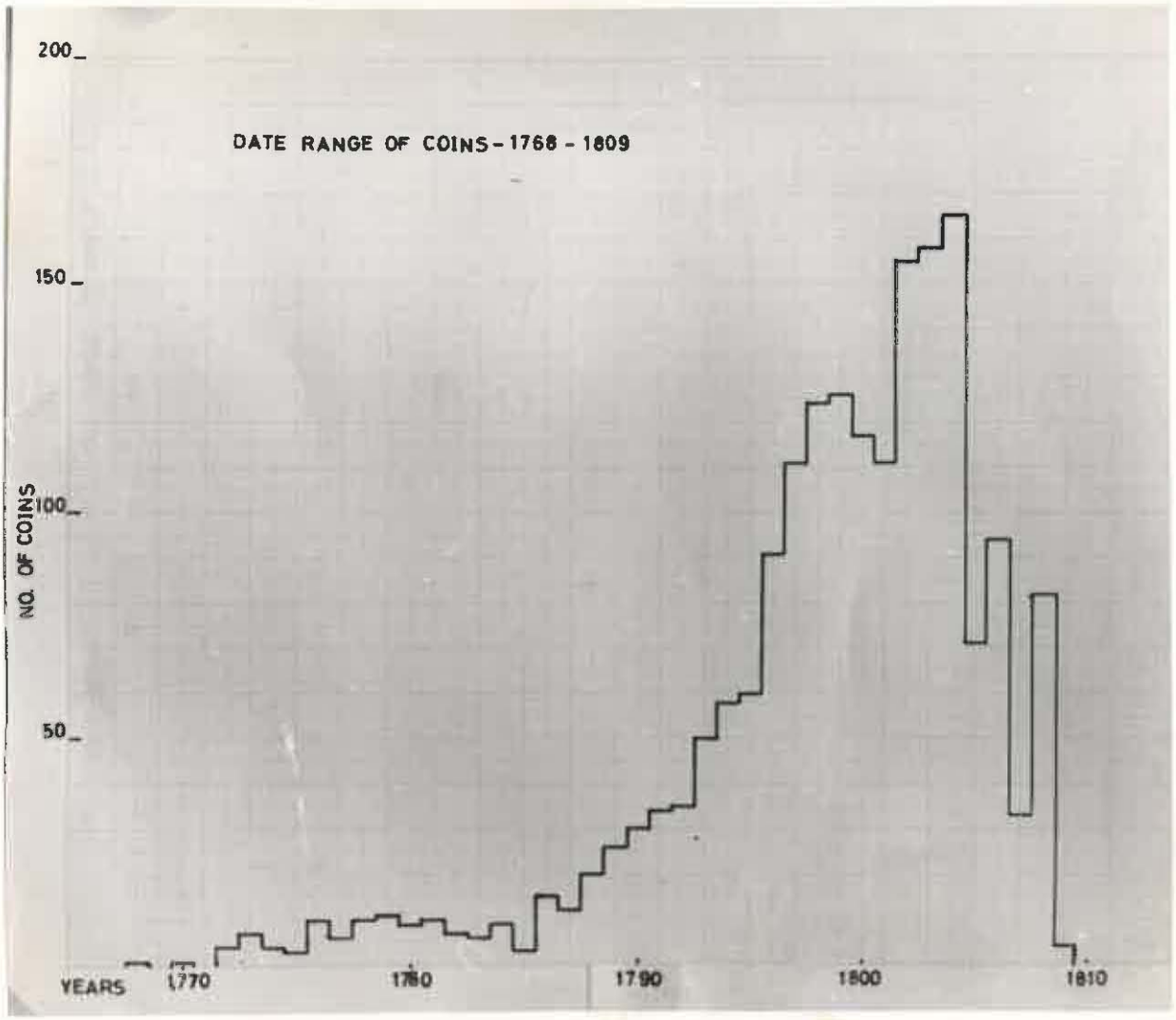

Fig. 22 The coin numbers peak at 1802-04. Histogram by Fairlie Sawday

In addition to the Spanish coins there are 11 United States dollars among the cleaned identifiable coins.

Fig 23. a) The head of George III counterstamped on an 8 real piece
b) Obverse of a 1799 United States dollor
c) Reverse of a 1799 United States Dollar

Note: The scale varies

The coins are a very strong indicator of the date of the wreck. The large sample, having a date range of 1768-1809, with a peak at 1802-04, suggests that the ship was wrecked in 1809 or very soon afterwards. The other possibility is that the entire consignment of coins were old coins, and that the few more modern coins which would have inevitably leaked into such a consignment have not yet occurred in the sampling. The size of the sample already analysed however, makes this unlikely.

Do the coins have any implications in terms of the nationality or last port of call of the vessel? The mere presence of a substantial quantity of any coins on the wreck suggests that it was lost on an outward voyage from Europe-American rather than on a homeward voyage, when all money would have been spent on cargo.

The Spanish coins do not indicate a Spanish vessel, as such coins were used by all the major trading nations at the time. The counterstamped head of George III on a single Spanish coin is not a strong indication that the vessel was of British origin. The coins counterstruck by the Bank of England were intended for circulation within Britain, but some would have leaked into outside circulation. When the chests (or bags) of coins (which ultimately sank with the Point Cloates Wreck) were originally purchased, at some financial centre, they may have been made up to weight by the seller. Alternatively, the owner of the vessel could have mixed in some other coins with the Spanish dollars. The 11 United States dollars may have fortuitously slipped in, in like fashion. However, the greater number of United States dollars could be taken as a slightly stronger indication of United States associations with the vessel.

On vessels of the period, the crew were normally quartered in the forecastle, while the captain and officers had cabins in the stern. A consignment of coin would also have been kept in the stern. The Spanish coins on the Pt. Cloates wreck obviously represent a consignment, but it is possible that the U.S. dollars belonged to the captain or officers. The location of the U.S. dollars on the site does not provide a means of differentiating them from the consignment; there are no indications of pockets of specific types of coins having come from particular locations on the wreck.

b) Marked Copper Hull Fittings

A number of copper fittings from the keel and the sternpost of the wreck bore the stamped name 'J. DAVIS'

Fig 24. A copper hull fitting bearing the name J.DAVIS Photo Pat Baker

The immediate question which arises is that of what sort of person the name J. Davis represents. Is he a bronze founder, a ship's chandler, a ship-builder or a ship-owner? Or could the name represent that of the ship itself? The fittings of British naval vessels were stamped with the Admiralty's mark. In the case of the barque Day Dawn, sunk near Fremantle in the late nineteenth century, the vessel's name was found burnt into timbers. However, a ship's chandler is the person who would see most commercial advantage in having his name appear on hull fittings for a merchant vessel.

Correspondence enquiring about J. Davis has been directed to the Institute of British Foundrymen and the Association of Bronze and Brass Founders in England with negative results.

Inquiries in the United States were more productive. Jonathon Davis and Sons are listed (Fairburn, 1945-55) as having built 22 vessels at Bath in the State of Maine in the years 1785 to 1819, all but 2 of them prior to 1807, as the Davis business failed in 1808 due to Jefferson's embargo.

The vessels listed are as follows:-

	1785	Lark, sloop 81 tons
	1788	Union, brig 100 tons
	1790	Union, Schooner 14 tons
	1790	Speedwell schooner 61 tons
	1790	Atlantic ship 254 tons
	1792	Mercury brig 193 tons
	1793	Minerva schooner 83 tons
	1793	Speedwell brig 170 tons
	1793	Maraton ship 224 tons
	1795	Mercator ship 224 tons
	1795	Dolphin sloop 80 tons
	1796	Kingston ship 409 tons
	1796	Hero schooner 130 tons
	1799	Antelope ship 252 tons
	1800	Henry brig 152 tons
	1801	Spartan ship 248 tons
	1803	Frances brig 183 tons
	1804	Decatur brig 142 tons
x	1804	Suffolk ship 203 tons
x	1806	Antelope ship 224 tons
x	1815	Thomas Fowles ship 340 tons
x	1819	Beaver brig 205 tons

Those vessels I have marked with a cross are known to have been afloat after 1815 and are thus unlikely candidates.

In addition to building ships, Jonathon Davis was a merchant and ship's chandler, and managed a fleet of ships. In 1799 he put in a bid to furnish timber for the building of the frigate Essex. Most

of the structural copper for shipbuilding in the Massachusetts Bay area at that time was provided by Paul Revere (Dudley, 1979). Well into the first quarter of the nineteenth century most of the copper used in the U.S. was imported by the Hendricks family of New Jersey who distributed it to the various smaller shops, Even the Revere Company obtained its raw material in this fashion. The Hendrick papers are reportedly on file in the New York Historical Society. It is thought that they might contain the names of customers who furnished raw copper (W. Baker 1979).

There is no direct evidence that any of the merchants in the Kennebec region around Bath engaged in the East India trade from their home towns (Baker); there was no local market for the type of goods imported. But they had many connections with merchants in Boston and Salem. Jonathon Davis Junior resided in Boston where he would have been familiar with the East India trade. In 1793 he proposed building a ship of about 500 tons for the East India trade, but it is not known whether the vessel was built.

It may be said that the evidence points strongly towards Jonathon Davis having been associated with the Ningaloo vessel as a chandler or ship-builder. This also suggests that the vessel would likely have had its home port on the east coast of the U.S., perhaps between Bath and Boston.

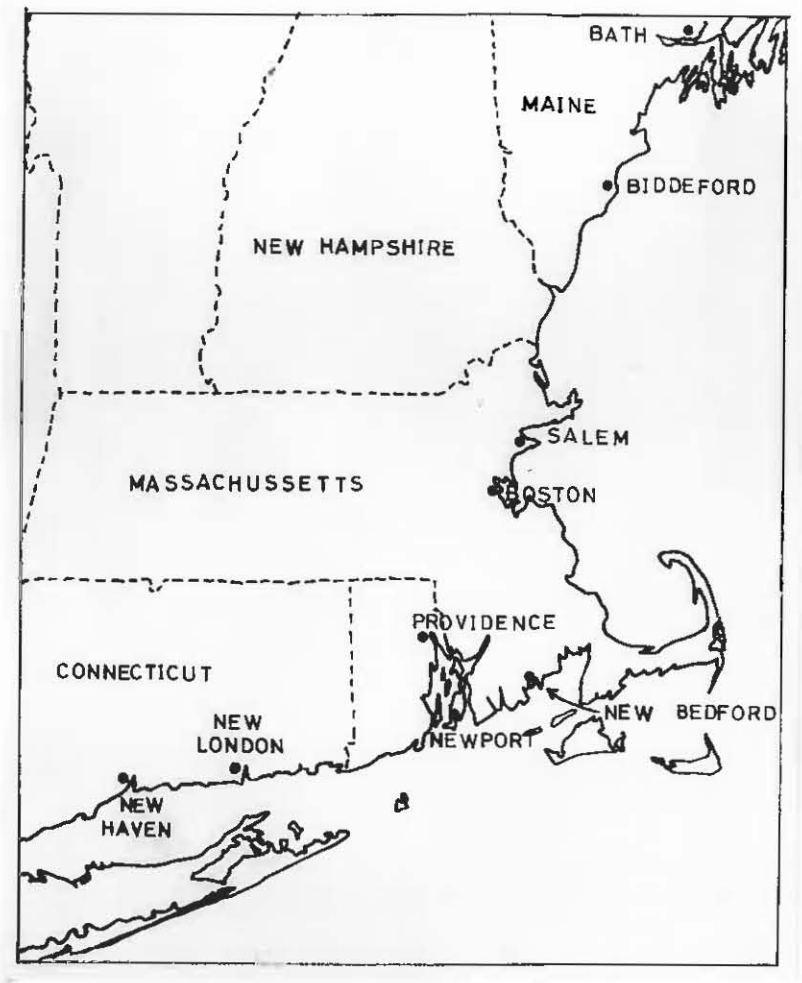

Fig 25. The ports of Massachussetts Bay

(c) Ceramics

A variety of ceramic material, mostly in poor condition, has been found on the site. This indicates both Asian wares and European/American. The Asian material consists of small quantities of blue on white porcelain, and brown glazed earthenware. Enquiries about the blue on white

porcelain (Graham, 1978) have suggested Chinese porcelain of the K'ang Hsi Period (1662-1722), a type which was fashionably collected until the mid-nineteenth century. The analysis of Asian wares may however, have a limited usefulness in terms of identifying the Ningaloo wreck. If we assume that the vessel is an outward bound American or English East Indiaman, then the Asian wares would have been collected on previous voyages or even in America or Europe.

Fig 26. Floral pattern transfer earthenware in greenish-yellow
Photo Pat Baker

Most common among the European type ceramics is an earthenware with a transfer floral pattern in olive green. This ware is represented by plates, meat dishes etc. and does not have a manufacturer's mark. One opinion (Graham) is that the ware is English, probably Staffordshire, of about 1830. This date however, conflicts sharply with that suggested by the coins (c1809-12).

The most interesting of the stoneware is a fragment of a jug, stamped with the word 'BOSTON'. Stoneware was being produced at Boston as early as 1743 (Ketchum, 1971).

Fig 27. Blue painted porcelain sherd. Photo Pat Baker

Fig 28 Brown glazed earthenware sherd with four ears

Fig 29.

A salt-glazed stoneware jug stamped 'BOSTON'

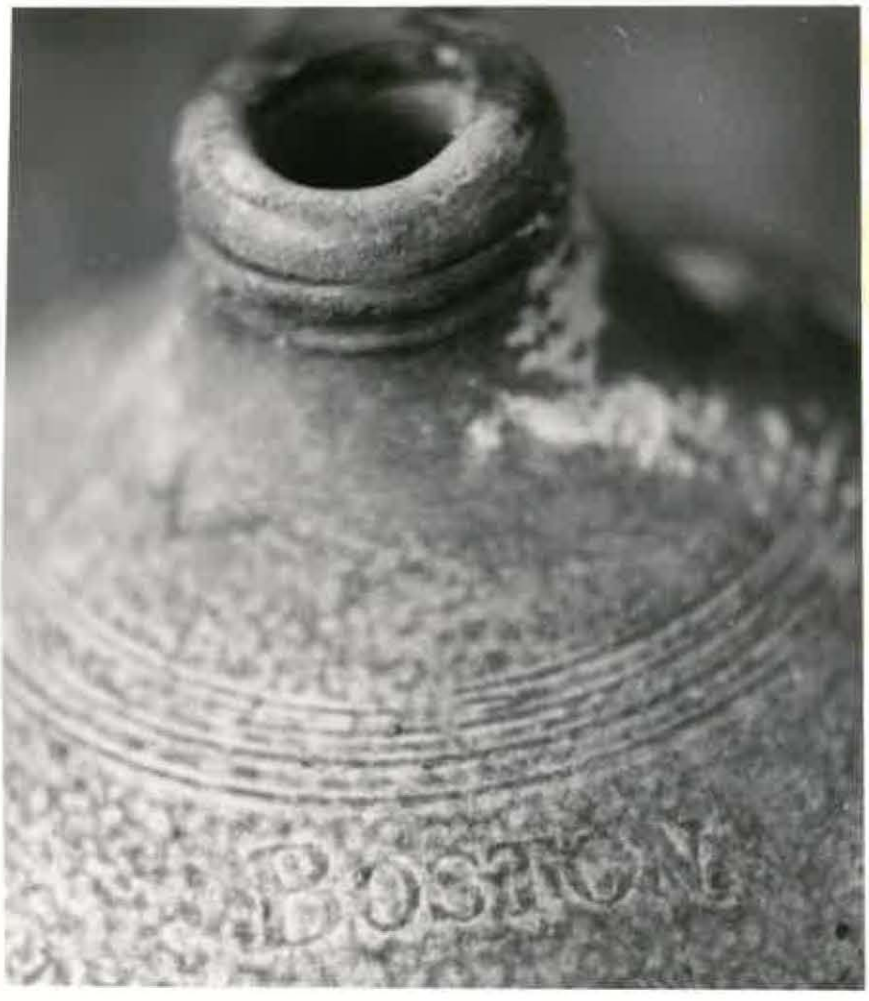

Fig 30

Detail of stamped 'BOSTON'

At the very beginning of the nineteenth century there appeared a variety of ocher-stained stoneware (mostly crocks and jugs) marked 'BOSTON 1804'. It is believed that some of these pieces were made by Jonathan Fenton, active in Boston in the late 1790's.

d) Timber Samples

Two sample pieces have been identified (Pang 1979) and the typing confirmed by CSIRO in Melbourne. These were of the white oak group, and spruce. The white oak is a light coloured wood that grows in the Eastern half of the U.S.A. It is very durable both in and out of water and possesses great strength. The spruce is a tough, light wood which is fairly durable when used in wet and damp places. For this reason it is used for floors, for keelsons and for longitudinal members of vessels' framework.

More samples will need to be analysed before the timber can substantially assist in the identification of the wreck, although these woods already point to America or Europe.

E) Anchors

Three anchors have been located on the site. The largest of these measures 4.23 metres, the exact length of the best bower anchor from the Investigator.

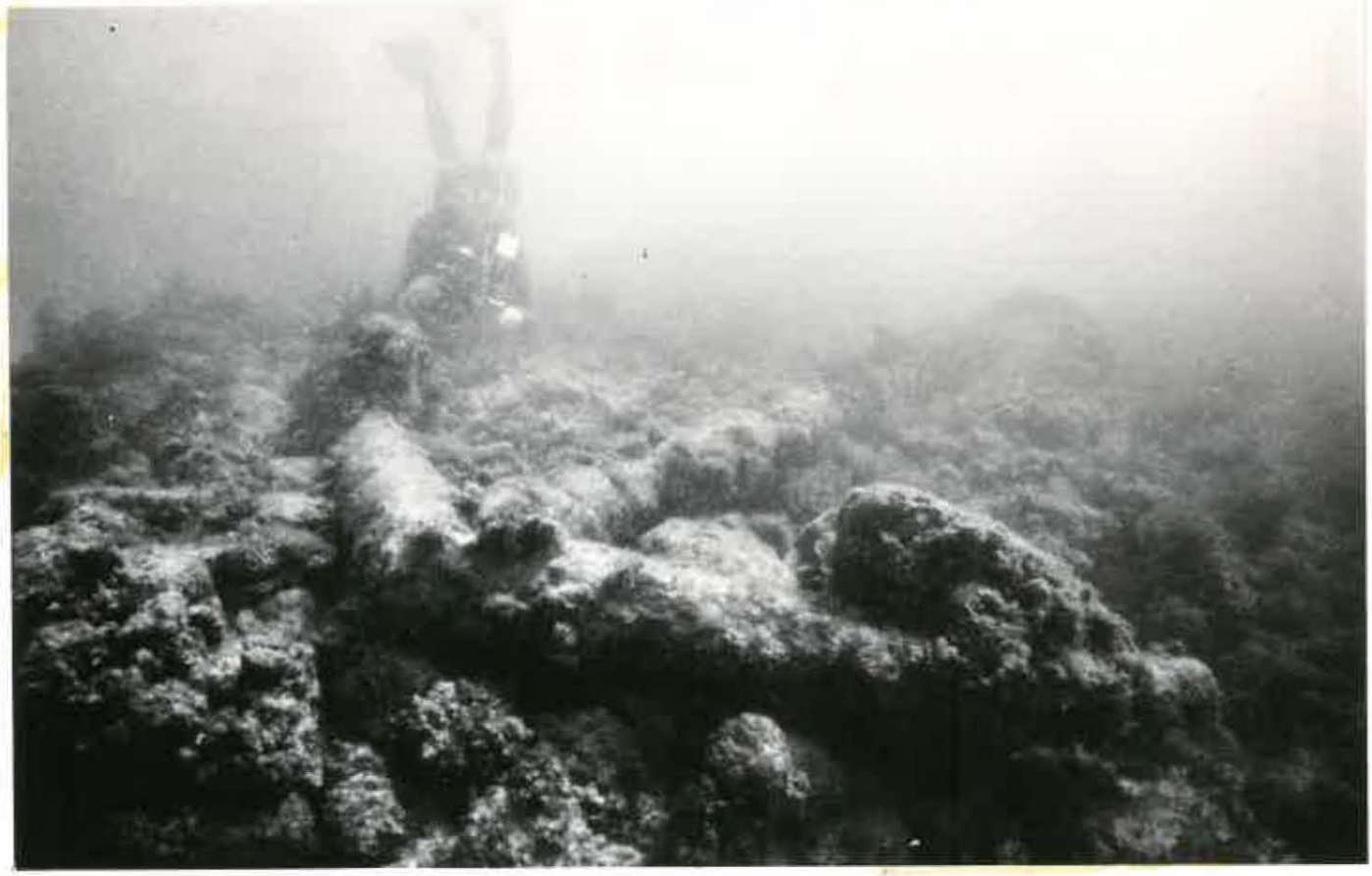

Fig 31. The second anchor Photo Pat Baker

The weight of the Investigator anchor was 1230kg (24.5cwt) which would be close to the weight of the Ningaloo wreck anchor. For vessels smaller than frigate the U.S. Navy in 1800 used anchors weighing 51b per ton of vessel. The British Navy of 1800 used 41b per ton. Applying the American calculation to the inspected site would suggest a large vessel of some 490 tons. Of the vessels definitely known to have been built by Jonathon Davis the Kingston at 409 tons is the only vessel approaching this burthen. It is

not known whether the Kingston was ever involved in the East Indies trade. The anchor size corresponds well with the 500 ton vessel which Davis proposed building for the East Indies trade in 1793.

The smallest anchor (2.33 metres) is a kedge anchor, having an iron stock. Rubin (1971) states that in 1800 the Dutch, Danes, Swedes, French and English all used wooden stocked anchors, but in the Royal Navy of 1807 iron stocks were used on some small anchors of less than 1500lbs. In 1832 this was raised to 3000lbs. Iron stocks were infrequently used in the British merchant navy until later in the century.

f) Cannon

Six cannon have been located on the wreck site and of these three have been raised. The largest is a cannon with a length of 1.53m and a bore of 8.5 cm (probably a 4pdr). The crowned monogram 'GR3' King George III of England (1760-1820) is embossed above the trunnion, and the cascabel is marked with the broad arrow denoting British crown property.

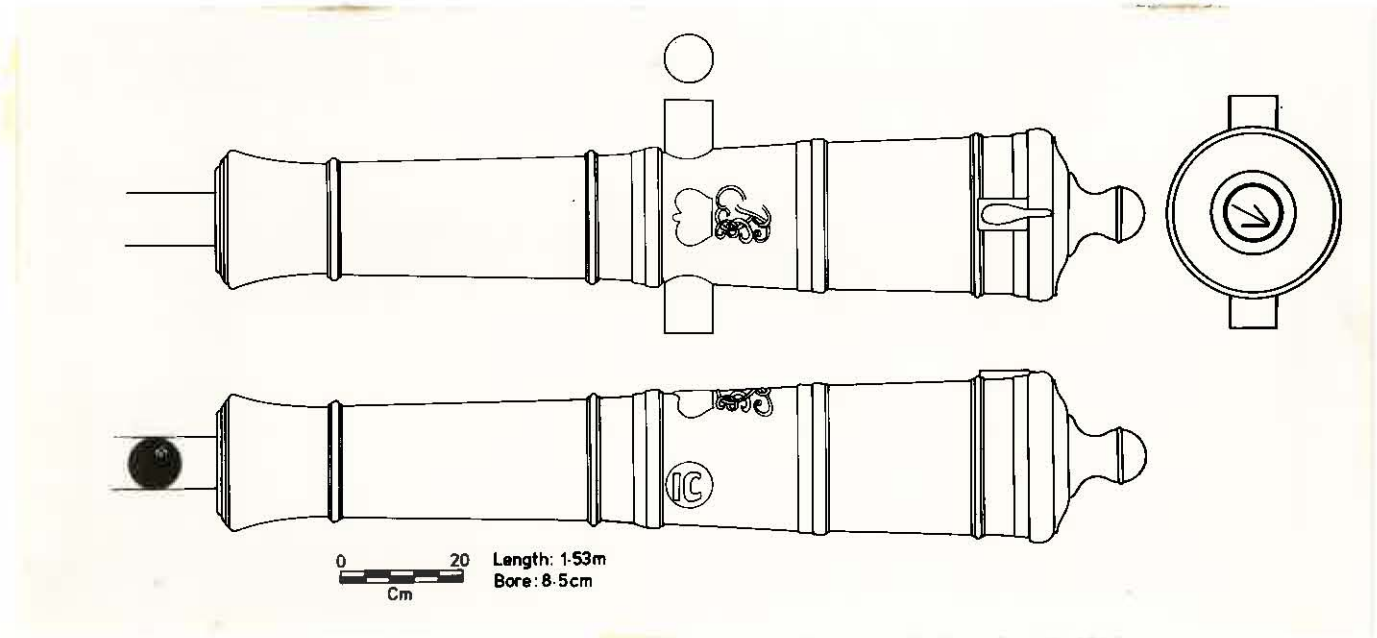

Fig 32. The larger cannon raised. Drawing Myra Stanbury

The letters IC embossed on the left trunnion probably indicate that the piece was made by Joseph Christopher, a British gunfounder whose family was active from 1760-1820. The British origin of this gun does not detract from any argument that the vessel itself is American. Prior to the Revolution the manufacture of cannon had always been a British prerogative, and Colonial ironmasters lacked both the techniques and technicians to produce the necessary weapons in any quantity. So American vessels during and for some time after the Revolution relied heavily on guns acquired from the British.

The second and third guns raised both appear to be carronades. One has been cleaned and is a carronade of 113cm length and 4.52in. bore

(a 12pdr) and bearing an incised narrow triangle (to the left of the sighting line) pointing forward behind the first reinforce. It is cast with a lug under the gun, instead of trunnions. A heavy pin fastens the lug to a slide, which would originally have been held in a slotted carriage. No other markings are visible on this piece, but chemical tests have indicated that the triangular incision contained the remnants of a copper implant.

Fig. 33. A carronade is cleaned at the laboratory Photo Pat Baker

A quantity of shot was found on the wreck, close to the main-mast step where the shot locker would have been. The shot was in canisters; tins of cast iron balls of small assorted sizes which would have had the effect of a large shotgun type blast. It was a short range projectile; after some 200 yards the shot spread so widely that it lost its effect. As such it would have been most suitable as an anti personnel weapon, a likely requirement on the Sumatra coast.

Fig 34. Cannister shot from the wreck - Photo Pat Baker

(g) Glass Bottles

The glass bottles and sherds found on the site varied in size but were generally slightly squat, cylindrical, with the mouth everted above a string rim. Similar bottles have been dated to the 1780's and 1790's

Fig 35. One of the complete glass bottles

(h) Copper Fastenings

Excavation revealed a large component of copper fastenings in the hull of the wreck at Ningaloo. The frame was held together with copper bolts, and the planking was held together with copper nails featuring hammered chisel points and four-sided rose heads. The vessel had been sheathed in copper, and although little of the sheathing itself has survived, the sheathing tacks were to be seen.

Fig 36. Copper hull fastenings

Rolled copper sheet began being produced in Maryland in 1782, and at Boston in 1794 (Chapelle, 1967). As the war of the French Revolution progressed, however, coppering increased. The thin copper plates were tacked over felt, which was set with hot pine tar on both sides. Hence, until well into the second decade of the nineteenth century, American merchant vessels usually retained iron fastenings, protected by tar and felt from electrolysis. The wasting of the pure copper alloy fastenings were commonly employed. The advantages of a clean bottom in a fast sailer were obvious, and many sharp American schooners, as well presumably as East Indiamen, were copper sheathed and fastened after 1795, though this was expensive until after 1815 (Chapelle).

The implication of the above is that the Ningaloo wreck, if American built, was constructed in or after 1794.

4A - Ships Which Might Have Been Lost at Point Cloates

(a) Post Western Australian Settlement

The Swan River Settlement, established in 1829, attracted vessels to the West coast of Australia from several directions, including the North. The earliest such vessel to be lost was the Mercury (255 tons), a barque which disappeared in 1833 while on a voyage from Calcutta to King George Sound. The Bombay built vessel set sail at a time when there was an acute shortage of silver in the Swan River Colony, and in 1834 the government organised several expeditions to Shark Bay to search for silver coins and survivors reported by the natives to have been washed ashore. However, there is growing evidence against the wreck at Ningaloo being the Mercury. Firstly, the coins are a strong indication that the vessel was lost soon after 1808. Secondly, the large anchor suggests a vessel of c490 tons. Thirdly the items marked 'J. Davis' and 'Boston' tend to suggest an American built vessel from an American port. Fourthly it might be expected that a Bombay built vessel would have yielded teak samples rather than oak and spruce.

In later years a number of vessels have been lost in the area, some in poorly documented circumstances. In May 1876 the police sergeant at Roebourne, investigating the wreck of the Stephano at Point Cloates, wrote:

> "In addition to the wreck of the Stephano there were lying on the sea shore and on the rocks near there, the wrecks of three or four other vessels all broken up. ....One of the wrecks there is of a vessel of about 2000 tons register. It is not known what any of the vessels are, but the Stephano".

But all these later vessels could easily be differentiated from the Ningaloo wreck on the basis of the artifacts to be found.

(b) Trade Routes Passing Point Cloates

Vessels had been sailing across the southern Indian Ocean from Cape of Good Hope to the East Indies since Brouwer pioneered the route in the early 17th century. By the early nineteenth century China trade vessels were either passing to the north of Australia to China via the Straits Settlements, or alternatively around the south and east coasts of Australia. On the former route (which also included vessels in the Sumatra pepper trade), courses varied from a diagonal path across the Indian Ocean heading northeasterly from the Cape to Bencoolen, to an easterly path as far as Amsterdam Island before turning northeasterly, bringing such vessels relatively close to the Northwest coast of Australia. Large numbers sighted the West Australian coast, and some were wrecked. Halls (1975) lists 25 East Indiamen which recorded having sighted Point Cloates between 1620 and 1811, and there would have been many more. In 1806 the American ship Arthur, bound from Providence to China carrying 140,000 silver dollars, came close to the Northwest coast at night in extreme darkness. The man on the foreyard was unable to see land and but for the fortunate sighting of land from the deck the ship would have struck the rocks. The Arthur's charts were found to be erroneous, the whole area being laid down too far to the westward (Hedge, 1968). The outward bound East

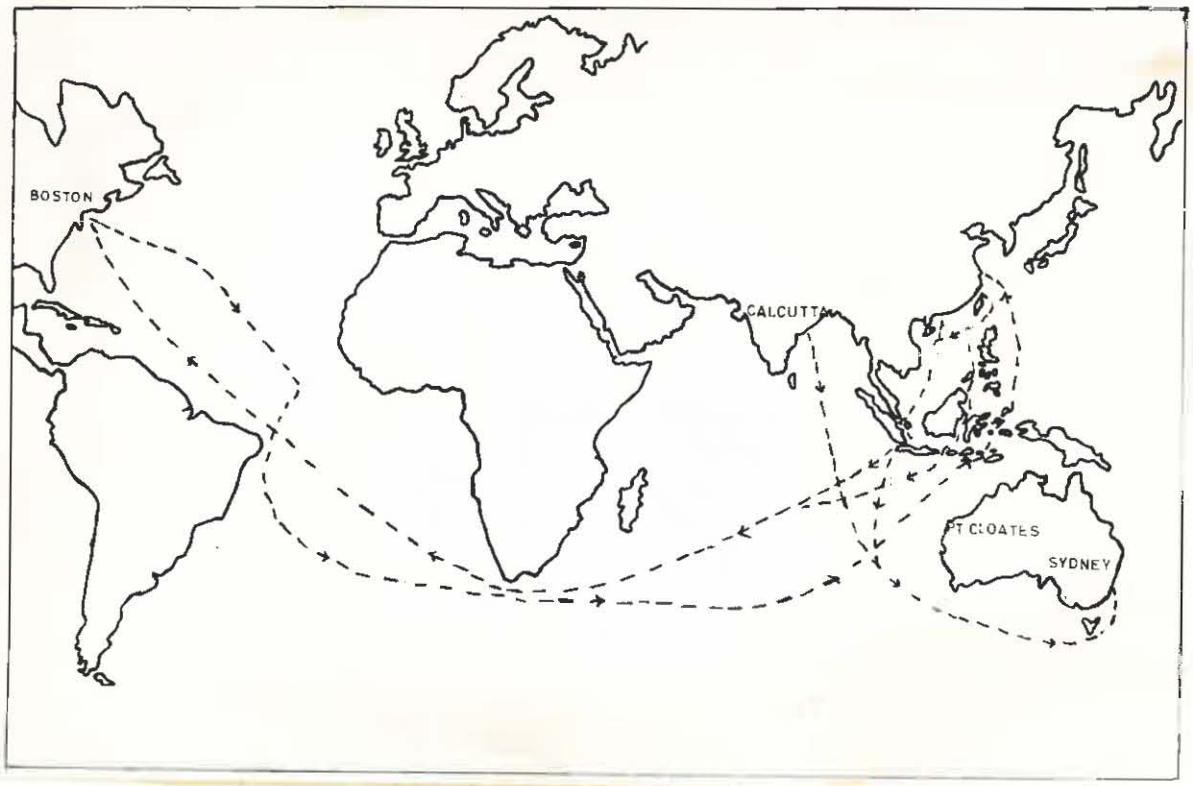

Fig 37. Sea routes which brought vessels close to the north west coast of Australia

Indiamen at the beginning of the nineteenth century carried currency and were very often in ballast. For example the Salem built Margaret, 299 tons, which in 1800 was in ballast with $50,000 in silver, and armed with 6 carriage guns. The profits of the early pepper trade were so large that the merchants wasted no time collecting cargo for the ships; they simply sent them out in ballast with the money. It was not necessary to rely on any profit on the outward voyage (Phillip, 1949). The first mixed cargoes exported to China on American vessels showed that ginseng, an aphrodisiac, was the best seller, but the problem of finding a viable product for the Canton market led to the collection en-route of sea otter furs on the Northwest coast of America, then the sandalwood and seal skins of Pacific islands, and later the beche-de-mer. American vessels are first known to have stopped in Australian waters in 1792, when the whalers and elephant sealers Asia and Alliance, both of Nantucket. called at Shark Bay, a little south of Point Cloates (Stackpole, 1953).

The size of the East Indiamen involved varied considerably. The early American vessels were small, mostly ranging from 100 to 250 tons (Dodge, 1973), but in the early nineteenth century larger vessels were used. The British vessels were considerably larger, falling into 3 main classes. The 1200 ton class was employed in the China trade while the 800 ton and 500 ton classes were both meant for India waters. The China ships carried 36-38 guns, the 800 ton vessels 26-32, and the 500 ton vessels 12-20 guns.

Another shipping route requires some mention. After the establishment of settlement on the East Coast of Australia in 1788, there was a traffic, principally by British owned vessels, between Asia and these settlements. From Sydney to India such ships travelled south and west past Cape Leeuwin before turning northward into the South East trades, or, during the winter months sailed up the East coast of Australia before turning westward through one of the straits. When sailing from India or the Straits Settlements to Sydney they would take a course southward past the Northwest coast to take advantage of the Westerlies along the South coast. Such vessels would be in cargo, but if it was a light cargo some ballast could be expected.

Given that these two routes would bring a vessel reasonably close to Point Cloates, what are the factors which might lead to such ships being lost on the coast? Factors to be considered include navigational errors, poor charts, rough weather, destruction by fire, deliberate scuttling, and whaling or sealing. Many of the vessels went to sea without adequate provision for navigation. In 1790 the Boston ship Massachusets of 600 tons (the largest merchant vessel built in the United States up to that time) sailed for the East Indies without a chronometer, and without a single officer who could work a lunar observation. Charts of the time, often very inaccurate, showed Point Cloates as an island a great distance from shore. Both these factors could account for a vessel striking the coast at Point Cloates. However the position and condition of the wreck are perhaps more significant. Lying behind the reef it must have been deliberately navigated in through the narrow channel (perhaps with the aid of a kedge), and this undertaking would have required reasonable weather conditions.

Why was the vessel taken inside the reef?

Excavation of the wreck has revealed indications of extensive burning having taken place: charred wood and molten lead are widespread in the stern section. It may be that the vessel caught fire at sea and was brought in behind the reef with the idea of saving whatever could be salvaged in the shelter of the reef. Alternatively, the vessel may have struck bottom and filled, then been burnt by the crew to salvage fittings. If this was the case it would imply that a second vessel was standing by, or arrived later, to receive the fittings. It also brings us back to the question as to why the vessel was taken inside the reef. It may have been leaking badly and was run ashore, or the crew may have deliberately scuttled her, as occurred with the Bounty at Pitcairn Island. In 1814 the 150 ton Argo was carried off by convicts from Hobart while en route to Mauritius, and was never heard of again. However the excavation at Ningaloo would seem to indicate a larger vessel than the Argo.

If the vessel was whaling some evidence of tryworks would be expected in the wreck, and this has not been found. In 1792 the

American whalers Asia and Alliance visited Shark Bay, but took no whales there, though they saw finbacks from 19° 47' S. northwards. Nor did they see any seals there, and published accounts (Abbott, 1979) do not indicate that any other vessels caught seals in the Shark Bay - Point Cloates area.

The most feasible explanation for the vessel going behind the reef then would seem to be that of distress, through leaking or burning.

5. Conclusions Regarding Identity

The wreck at Ningaloo was in ballast and carrying a consignment of coins presumably for the purchase of cargo. The most feasible explanation of these circumstances is that it was an outward bound East Indiaman. The name 'J. DAVIS' appearing on hull fittings is strong circumstantial evidence that the vessel was built relatively close to Bath or Boston in the United States, and the name 'BOSTON' stamped on a jug suggests that the vessel sailed on its last voyage from a port in this area, perhaps Salem or Boston. The coins found on the wreck suggest a date of sinking soon after 1808, and the presence of copper fastenings suggests that, if American built, it was constructed after 1794. The anchor suggests that it was a relatively large ship, say 400-600 tons. Jonathon Davis' Kingston, 409 tons, built in 1796 is a possibility, but to date no evidence has been unearthed of that vessel entering the East India trade. Similarly the 500 ton East Indiaman which Davis proposed building in 1793 remains shrouded in mystery.

The evidence strongly suggests a U.S. built vessel sailing for the East from an American port, but some of the evidence could be seen as suggesting a British vessel. The gun bearing the broad arrow and the monogram of George III has already been mentioned. Coal samples would appear more likely to have come from European mines than from America or Australia. The English East India Company's 500 ton class vessel, mounting 12-20 guns may approximate the expected tonnage of the Ningaloo wreck but is more heavily armed. Another possibility is that it was an American built vessel sold into Continental European ownership.

If it is assumed for the moment that the vessel was an American ship involved in the Sumatra pepper trade or the China trade, then a calendar of events can be constructed to assist in the direction of future research:

a) The years 1805-7 were good ones for the pepper trade, there being 5-7 ships each year.

b) The Jefferson Embargo (Dec 1807-1809) meant that no ship could sail out of American ports. Thus in April 1809 there were no American ships on the Sumatra coast.

c) In 1810 Salem had a boom year, sending 10 vessels to Sumatra.

d) The 1812-15 War stopped the trade.

Thus, the years 1810-11 would seem to be the most promising years in which to direct attention to American shipping losses.

6. Recommendations

(a) Further excavation

The complete assemblage of material from the wreck at Ningaloo will give the best chance of identification, as well as facilitating research in other directions. Such information as the overall length of the vessel, the total number of cannons, the overall composition of the ceramic collection, etc. requires completion of the excavation. During the 1978-79 season the excavation progressed from the stern of the vessel to midships. A similar season in 1980 is required to excavate from midships to the bow, and to do some exploration around the perimeter of the ship. Eight weeks during the period April - May would provide the best weather for this work.

(b) Archival Study

It is doubtful that on site fieldwork alone will provide sufficient data for identification. It has become clear that the site is pre-Western Australian settlement, and that the identity of the vessel is not to be found in our own State Archives. The artifacts analysed to date point strongly towards the vessel having come from an area not far from Boston in the United States between the years 1809-1812. Extensive correspondence with libraries and museums in that area has been helpful and is continuing, but it has not succeeded in providing a name to the vessel. The identity of the wreck is vital for further research, and this makes it necessary that a staff member personally research the relevant material at source in the United States.

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Appendix 1

A PRELIMINARY REPORT ON COINS OF THE NINGALOO OR POINT CLOATES WRECK

by

S. J. Wilson
Curator of Numismatics
Western Australian Museum

From the limited number of articles recovered from the wreck and information discovered in records there is a strong possibility that the ship was built in the United States of America and in the Boston area. Bronze fittings holding the rudder show the "Founders" mark as J. Davis who was building ships near Boston prior to 1800. The timber is thought to be oak and part of a saltglazed stoneware jug with Boston marked on it has been recovered. The evidence is circumstantial, but until further work is carried out on the site nothing more definite can be said of its identity. The ship appears to have been in ballast and carrying a substantial quantity of Spanish silver coin which rather points to its being on an outward trading voyage to the Indies or South East Asia when it was wrecked.

The coinage is nearly all of Spanish pieces of eight reals mostly from the Mexico mint and the majority of these being dated between 1796 and 1804. The date of the latest coin recovered is 1809 which points to the date of the shipwreck being in the period 1810-1812.

The normal time lapse for movement of bulk coin from Mexico, (where most of the pieces were minted) to South east Asia was from eighteen months to two years although certain shipments minted on special order did arrive within twelve months.

The following lists show details of a survey of 3500 Spanish coins from the ship which should give a representative cross section of the whole consignment. A few coins of other than Spanish origin have been found but these do not substantially alter the composition of the hoard. One of particular interest is an Eight Real piece of Charles the fourth counter-stamped with a small oval effigy of King George the Third of England. The Bank of England counterstamped 2,325,099 of these during 1797 and issued 1,490,527 to the public to circulate at a value of four shillings and nine pence (4/9) and in some measure to relieve a severe shortage of general coinage. By October 1797 so many counterfeit dollars and genuine coins with forged countermarks were in circulation that the bank withdrew as many as possible by offering to pay full value (4/9) for all coins presented. At the 31st October when the offer was cancelled there were still 137,007 of these pieces outstanding and our coin is one of these. Another factor which adds to its scarcity is that after the defeat of Napoleon in 1815 the price of silver rose considerably and most of these odd dollars went into the melting pots of the silversmiths.

Other interesting coins included eleven silver dollars of the United States of America in the period 1788-1803.

Although the hoard is very interesting numismatically and illustrates the movement of bullion and its use in far eastern trade at the beginning of the 19th century it is intrinsically not worth much more than its silver content as almost 90% of the coins are badly corroded and not of particular rarity.

The remainder of the 18,000 coins will be listed and surveyed when they have been treated by the Museum Conservation Laboratory.

Survey of 3500 Spanish coins from the "Ningaloo Wreck" as a statistical cross section of the 18,000 recovered to date June 1979 including a sample of 525 dated coins

MINT	TOTAL NUMBER (%)	CHARLES III 1759 - 1788	CHARLES IV 1788 - 1808	FERDINAND VII 1808 - 1833	SOVEREIGN UNIDENTIFIED	SUB TOTALS
MEXICO	1650 (47 %)	Dated 108	Dated 1234	Dated 8		1350
		Undated 11	Undated 97	Undated 1	Undated 191	300
POTOSI	267 (8 %)	Dated 17	Dated 225			242
		Undated 1	Undated 14		Undated 10	25
LIMA	244 (7 %)	Dated 20	Dated 191			211
		Undated 1	Undated 11		Undated 21	33
SANTIAGO De Chile	14 (0.4%)		Dated 12			12
			Undated 1		Undated 1	2
GUATEMALA	9 (0.2%)	Dated 2	Dated 7			9
MADRID	19 (0.5%)		Dated 16			16
					Undated 3	3
SEVILLE	14 (0.4%)	Dated 3	Dated 10	Dated 1		14
UNIDENTIFIED MINTS	1283 (36.5%)	Dated 43	Dated 521	Dated 2		566
		Undated 28	Undated 126	Undated 1	Undated 562	717
TOTAL ALL MINTS	3500	234 (6.7%)	2465 (70.4%)	13 (0.4%)	788 (22.5%)	3500
ALL MINTS	Dated 69%	Dated 193	Dated 2216	Dated 11		2420
	Undated 31%	Undated 41	Undated 249	Undated 2	Undated 788	1080
	100%	234	2465	13	788	3500

Survey of 525 dated coins by mint

M I N T	NUMBER	%	Adjusted % by redistribution of Unidentified mints
MEXICO	299	57%	83.3%
POTOSI	24	4.6%	6.7%
LIMA	26	5.0%	7.3%
SANTIAGO De Chile	2	0.4%	0.6%
GUATEMALA	2	0.4%	0.6%
MADRID	4	0.8%	1.2%
SEVILLE	1	0.2%	0.3%
UNIDENTIFIED MINTS	167	31.6%	nil
	525	100%	100%

Appendix 2

A REPORT ON THE CONSERVATION OF SILVER FROM THE WRECK AT POINT CLOATES

by

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Western Australian Museum

PART A: INTRODUCTION

One month after I joined the museum staff the first batch of some 6,000 silver coins from the Point Cloates (Ningaloo) wreck was handed over to the museum by the finders. This number was increased to about 19,000 after the main expedition thereby giving a total of 24,000 coins which were awaiting conservation treatment. The method in use was slow and costly in terms of labour and materials and the backlog would take about twenty years to clear. The need for a new method was obvious to all concerned; it had to be a cheap, simple and rapid method to be of use. After four months research I have developed the "Alkaline Dithionite" method which meets the above criteria.

Although silver and its alloys with copper have been used for centuries in coinage and for items of personal and ceremonial use the marine environment destroys the noble nature of the metal. A typical silver coin from a wreck site consists of a central core of uncorroded metal. Surrounding this central core is a layer of predominantly silver compounds, which we refer to as the corrosion layer. The major components of this layer are silver chloride, a mixed silver chloride - bromide and silver sulphide. The proportion of these compounds vary widely and are related to site conditions. On top of the corrosion layer is the concretion layer which typically consists of shell fragments, sand, copper compounds (from the copper in the original silver metal), iron compounds from other objects at the wreck site and sometimes massive amounts of silver sulphide. In some cases corrosion has gone so far as to leave no metal core. In other cases deposits of crystalline metallic silver have formed in the corrosion layer. All these factors and variations have to be considered when attempting to treat the coins.

The requirements of the archaeologist are that the maximum possible information be recovered from the treated coins. This means that the inscriptions and die stamps which were originally on the coins should be preserved in the treated samples. In general such information is preserved in the corrosion layer but not in the metal core. Consequently those methods of silver treatment such as ammonium thiosulphate[1], thio urea - formic acid mixtures[2] or citric acid then concentrated ammonia[3], which involve dissolution or removal of the corrosion layer are totally unsuitable. Previously reported procedures that reduced the corrosion layer back to silver, such as zinc in sodium hydroxide, were ruled out due to their inherent inefficiency and relatively high unit cost.

Initially electrolysis seemed to be very promising but it suffered from two serious problems. The major problem was that evolution of hydrogen from the coins frequently caused the corrosion layer to disintegrate leaving only the residual core or nothing at all. The second

problem was that of time. With the thousands of coins to treat the method would take decades before the backlog was treated.

PART B: THE ALKALINE DITHIONITE METHOD

The first stage in the treatment of marine silver is the removal of the concretion layer which is achieved by soaking the objects in 10 to 12 vol. % commercial hydrochloric acid in tap water. A convenient batch size of the coins is approximately 1000 or 22kg. This stage of treatment normally takes 12 hours but some more resistant concretions require soaking for up to a week. When all reaction has ceased the artifacts are removed from the bath and washed thoroughly with tap water. If a thick residual layer of concretion remains it can be safely lifted off with a dental pick to leave a very soft layer underneath which retains the original surface detail. The weight of the coins at this stage is typically 14-18kg.

The second stage of the treatment involves the use of an alkaline dithionite solution and for this an air-tight sealable container is essential. We use commercially available (approximately $6 each) 25 litre heavy duty black plastic drums with a wide neck and a screw top. The screw top provides the seal to prevent atmospheric oxygen reacting with the dithionite. The solution is prepared by firstly adding 40 grams of NaOH per litre of water then mixing thoroughly until all the sodium hydroxide has dissolved. Then, in quick succession, add 50 grams of $Na_2S_2O_4$ per litre of solution, followed by the silver artifacts and immediately seal the container. The container should be gently agitated to ensure mixing of the reagents and this is repeated every day for a week to expose all artifact surfaces to the solution. The agitation is achieved by gently rolling the drum along its side for a few metres each day.

After seven days the solution is decanted into a holding vessel and the coins are washed with fresh water until the wash solution is neutral. The grey powdery deposit of silver on the surface of the coins can be removed by brushing with a toothbrush. If a lustrous finish is required a final polishing with a fine fibreglass brush is recommended.

Tests have shown that the silver corrosion products are not dissolved by the hydrochloric acid wash and that even the chemically inert silver sulphide is reduced back to metallic silver by the alkaline dithionite. The overall reduction process may be represented by the equation.

$$6AgCl + S_2O_4^{2-} + 8OH^- \longrightarrow 2SO_4^{2-} + 4H_2O + 6Cl^- + 6Ag$$

which shows that dithionite is efficient on a weight basis; one gram of dithionite reducing approximately seven grams of silver chloride. We have treated over 3,500 coins by this method and have obtained very satisfactory and consistant results. The coins included are some two thousand from the Batavia (approximately one quarter of the total recovered) and many which had no residual metal core. In these cases the dithionite treatment produced a surface which could be polished to reveal inscriptions.

The method has been used by the author at the Ningaloo station

using modified apparatus. The ability to process coins using unsophisticated equipment in the field at remote locations is potentially a very useful tool for the Maritime Archaeologist. The unit cost of conserving the silver artifacts has been greatly reduced via the time saving factor of the bulk treatment and the availability of the chemicals as commercial grade reagents. Extension of this work to other "marine metals" has already indicated promising results.

PART C: SOME COMMENTS ON THE "NINGALOO" COINS TREATED IN THE CONSERVATION LABORATORIES.

Until a coin has been stabilised and polished it is uncertain that any numismatic information will be gained. A good example of this is the badly worn dollar of Carlos IV counterstamped with the head of George III (see report by S.J. Wilson, Curator of Numismatics). Until final polishing and careful excavation of the counterstamp the significance of this find was not apparent. Of the 1400 coins cleaned only about 2% of them are in anything like mint condition. The average weight of Spanish dollars of the period 1766-1809 was about 27.6 grams and a weight distribution of the cleaned coins gives a mean of 13.5 grams which represents a 50% weight loss from corrosion and erosion. - See figure I. The majority of the treated coins have some information on them which enables general classifications to be made; for example the mint masters initials can often place a coin of unknown date to within a range of ten years.

The densities of some 150 (11%) coins which were identifiable by date and mint were determined by Archimedes Principle. The corrected values were $10.18 \pm 0.22 g/cm^3$ which compares favourably with 10.38 for modern Sterling ("925") Silver. Coins of the period 1766-1809 from the Mexico mint showed no statistically significant change in density with regard to the year of minting. This information indicates that no debasement of the coinage was occurring during that time. In general the weight of the treated coins had to be greater than or equal to 18 gram to have a 90% chance of being identifiable by mint and date.

Analysis of the weights of the dated coins over all the Metropolita and colonial mints from 1766-1809 showed no correlation with their age i.e. the extent of corrosion of the coins is largely dependent on their microenvironment at the wreck site. The silver content of the 'pieces of eight' is approximately 94.5% by weight, the balance being made up by copper and as such is typical of coins from this period.

It should be noted that at various stages of the above "Alkaline Dithionite" treatment chemical hazards exist and the work should only be carried out in accordance with the safety notes published by MacLeod and North[4].

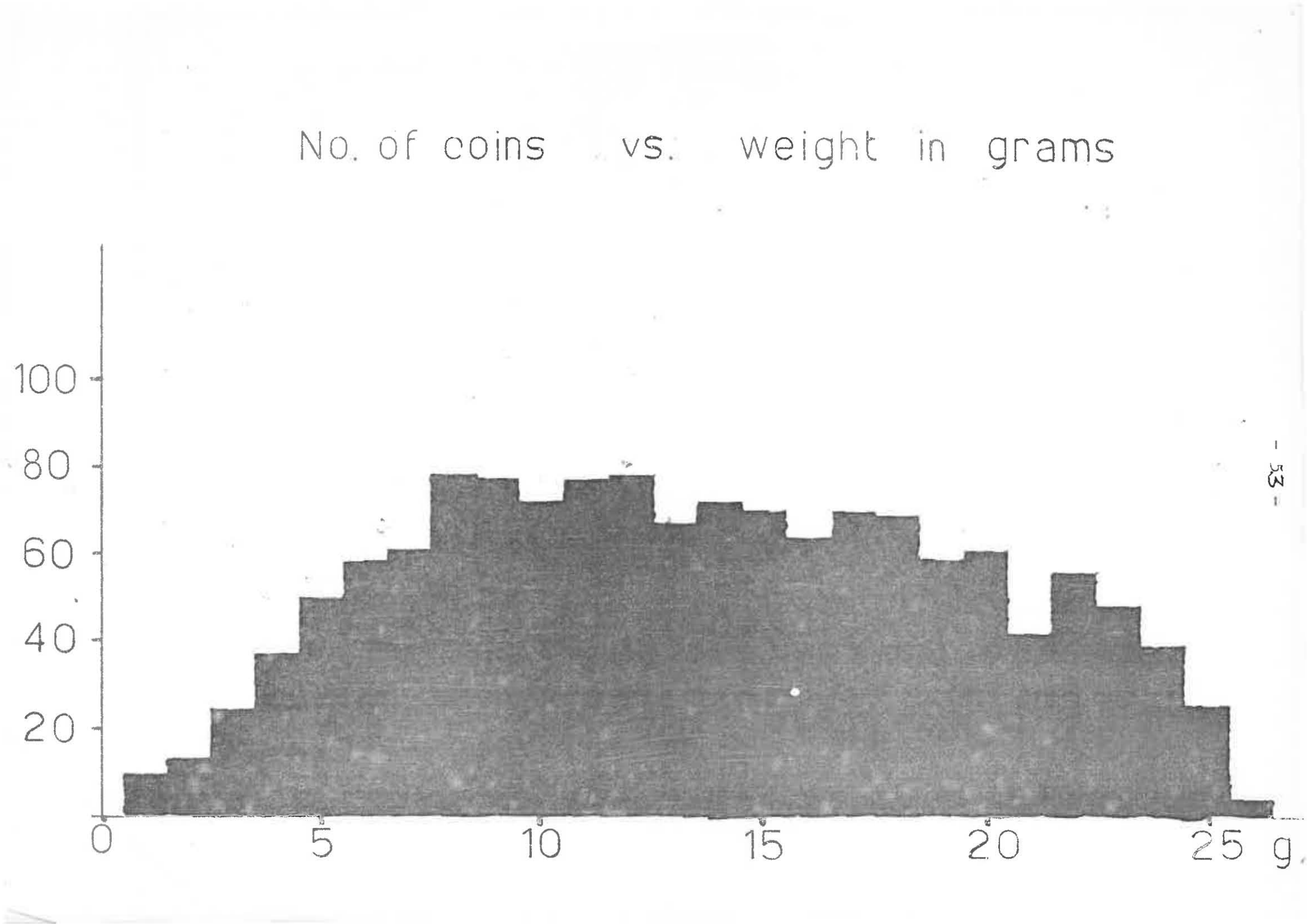
References

1) Plenderleith, H.J. 'The Conservation of Antiquities and Works of Art', O.U.P., London 1956 Ch. X pp212-231

2) Sramek, J., Jakobsen, T.B., and Pelikan, J.B., Studies in Conservation 23 (1978) pp114-117.

3) Al-Naqshbandi, A., Studies in Conservation 18 (1973) pp36-42

4) I.D. MacLeod and N.A. North, 'Conservation of Silver' accepted for publication in "Studies in Conservation".


No. of coins vs. weight in grams
100
80
60
40
20
0
5
10
15
20
25 g