



UNDERWATER ARCHAEOLOGY

Two articles and
a series of photographs

CEYLON and the UNDERWATER ARCHAEOLOGIST

By ARTHUR C. CLARKE

Ceylon, where I have lived since 1956, is almost virgin territory for the underwater archaeologist. My partner, Mike Wilson, and I first became aware of this when skin-diving off the great harbor of Trincomalee, on the east coast of the island. We were exploring some two hundred yards from a precipitous headland known as Swami Rock, which for three thousand years (according to local legend) had been the site of a Hindu temple. Although we knew nothing of the history of the place at the time of our first visit, we soon became aware that there was something peculiar about the sea-bed over which we were swimming. Huge blocks of stone were scattered in every direction and, though overgrown with weeds and barnacles, many had a curiously artificial appearance. At first we decided that this must be an illusion; the action of the sea can sometimes carve rocks into surprisingly symmetrical patterns. But presently we had unmistakable evidence that beneath us was the work of man, not of nature.

The capital of a stone doorway, badly eroded but perfectly recognizable, lay in the jumbled chaos of rocks. Beside it was a broken column, its square ends bearing on each face a lotus-petal design not unlike the Tudor Rose. As our eyes grew more skilled in interpreting what we saw, other regularities began to make themselves apparent. The ruins of some great building had been scattered along the sea-bed, where they lay in hopeless confusion. The water at the foot of the headland was quite shallow; where we were diving it was nowhere more than fifteen feet deep, and most of the broken masonry lay only about five feet below the surface.

It was not until some weeks later, when we were back in Colombo, that we learned the history of Swami Rock from Dr. W. Balendra, who has been largely responsible for the erection of the modern temple and has made the place a subject of special study.

The destruction of the temple began on the Hindu New Year's Day, 1624, when Portuguese soldiers disguised as priests mingled with the worshippers and so entered the sacred precincts. They waited until the temple was deserted by the New Year's Day crowds, who followed a procession down the hill and left only a few priests on Swami Rock. Then the plundering started; probably all those left in the temple were killed, and in a few hours the accumulated treasure of almost two thousand years was looted. The Konesar Temple—to give it its proper name—was one of the richest in Asia. It must have contained a fortune in gold, pearls, and precious stones, and though the Portuguese must have captured most of this wealth, they did not



ARTHUR C. CLARKE is a scientific writer of note as well as one of Britain's outstanding science fiction authors, his interests ranging from outer space to underwater exploration. For a paper entitled "Extra-Terrestrial Relays" published eighteen years ago in the journal, Wireless World, he has received the 1963 Stuart Ballantine Medal, the citation reading, ". . . his soundly-based and prophetic early concept of the application of satellites in the primary human endeavour of communication." In 1962, he received the Kalinga Prize, the annual UNESCO award for the popularization of science. In his first book Interplanetary Flight, he predicted with surprising accuracy events of the next ten years, and this prophetic talent is evident in all of his stories. He is chairman of the British Interplanetary Society and a member of the British Sub-Aqua Club. Since 1954 he has been engaged in undersea exploration and photography, first around the Great Barrier Reef of Australia, later along the coasts of Ceylon.

get it all—as was demonstrated three hundred years later.

In 1950, some workmen were digging a well in Trincomalee when they came across metal about a yard below the surface. Further excavation revealed the statues of three Hindu gods, which were handed over to the authorities—not, one imagines, without some reluctance, for they comprised more than a hundred pounds' weight of gold and copper alloy.

Further inquiries revealed that two other statues had been unearthed some months previously without the Archaeological Commission or the local authorities being any the wiser. All that Dr. Balendra's brochure *Trincomalee Bronzes* says on this subject is that "Persistent search was made for these finds . . . and they were ultimately handed over to the Chairman of the Committee appointed to restore the temple." This discreet statement, one cannot help thinking, leaves a great deal unsaid.

The five statues which now stand in the new temple are among the finest examples of Hindu bronze sculpture known to exist. In particular, the seated figure of Siva, which dates from about the 10th century A.D., is regarded as a masterpiece.

It is easy to guess how these statues escaped the attentions of the Portuguese. During the looting of the temple, the priests must have seized the most sacred images and buried them where they hoped they would not be discovered. They were found, in fact, about five hundred yards from the temple, and one must needs think that it would be most interesting to go over the rest of Swami Rock with a metal detector.

Although we have dived in this area on many occasions since 1956, we have never carried out a full-scale investigation, which would be impossible without heavy lifting gear. In any event, our attention was diverted elsewhere when, in 1958, Mike Wilson started operations on a remote and dangerous reef some seven miles from the south coast of Ceylon. The Great Basses reef, as it is called (Basses is a corruption of the Portuguese *baxios*, meaning shoal) consists of a line of rocks several miles long which lie just below the surface of the water. One larger rock, approximately the size of a tennis court, is about a yard above the waterline and is surmounted by a fine lighthouse built by the British in 1870. While he was exploring this area in March 1961 with two young American boys, Mark Smith and Bobby Kriegel, Mike Wilson discovered a small bronze gun lying on the sea-bed, which indicated

the presence of a nearby wreck. A larger cannon, partially buried in coral, was then discovered, and almost immediately the divers realized that silver coins were scattered all around the area. Although they had no suitable tools, they were able to chip out about 120 pounds of silver from the sea-bed and bring this back to shore, together with two small bronze guns.

The coins were identified by Commander Mendel Peterson of the U. S. National Museum as Surat rupees. Most appeared to be in mint condition. All bore the same date, A.H. 1113 (A.D. 1702) and most of them were in lumps of 1000, still in the shape of the bags into which they had been counted and packed (later we were able to discover fragments of the sacking of these bags). Owing to various vicissitudes, it was two years before we could return to the site, but in late 1963 Mike Wilson, Rodney Jonklaas (the well-known Ceylonese diver-naturalist), and myself were able to organize a more elaborate expedition. We were exceedingly fortunate in having with us Peter Throckmorton, who flew out from Greece to join us.

Despite many difficulties and considerable dangers, not the least those caused by the tremendous surge over the reef which often tore the divers from their positions, a survey of the site was carried out and a good deal of material recovered. Throckmorton was able to make quite an accurate plan of the wreck, and we obtained sample material which is now being studied, and which we hope will eventually identify the wreck.

So far, we have salvaged about 350 pounds of coins, but Peter Throckmorton estimates that at least a ton still remains on the site. (We have found records indicating that ships of this period carried up to five tons of silver on trading missions!)

The efforts of our small-scale expedition, limited by troubles with our boat and the short diving period between the monsoons, barely scratched this fascinating site. We are now taking steps, in cooperation with the Ceylon Archaeological Department, to safeguard this site legally so that only authorized expeditions can operate on it.

From its geographical position it is obvious that Ceylon must be surrounded by thousands of wrecks, accumulated over centuries of seafaring; we have visited about forty of modern times. Of course, most of the ancient ones will have disintegrated and will be completely buried beneath coral and debris, beyond any hope of recovery. It is only by an extraordinary series

of coincidences that we stumbled upon the Great Basses wreck.

I would like to end by mentioning one other fascinating prospect. In 1885 the P&O liner *INDUS*, steaming south from Madras to Colombo, went aground on a shoal known as Mullaivivu, fifty miles north of Trincomalee. There was no loss of life, but none of the cargo could be saved—and among that cargo was a collection of the finest works of art from the stupa of Bharut (2nd century B.C.). These had been specially selected by the Director of Indian Archaeology, General Cunningham, and today they would be priceless. However, we know that salvage operations were conducted on the wreck at the time and it is possible that these statues

were recovered. Until this is cleared up, it is obviously not worth making any plans for investigating the *INDUS*. If anybody has any information on this matter, we would be glad to hear it.

SUGGESTED READING

Accounts, illustrated with photographs, of the diving off Swami Rock will be found in *The Reefs of Taprobane* (1957) and *Boy Beneath the Sea* (1958). A preliminary report of the discovery of the Great Basses wreck is in the Appendix to *Indian Ocean Adventure* (1961). The full story of the 1963 expedition will appear in *The Treasure of the Great Reef* (Spring 1964) and *Indian Ocean Treasure* (Fall 1964). All these books are by Arthur C. Clarke and are published by Harper and Row.

The GREAT BASSES WRECK

By PETER THROCKMORTON

When I arrived in Ceylon, a great deal of preliminary research had been done by Arthur Clarke and Mike Wilson on the problem of identifying the Great Basses shipwreck. With the help of Major R. Raven-Harte, an expert on the history of Ceylon, they had established that the Dutch East India Company had used Surat rupees like the ones found on the wreck and subsequently identified by Commander Peterson as standard coinage in Southeast Asia. Major Raven-Harte searched the government records which had survived from that period, and turned up some fascinating references, one of which indicated that the *Overness*, a *fluyt* owned by the Dutch East India Company, had been wrecked on the Basses reef in 1704 on her way from Batavia.

He also found a transcript of the minutes of the Governing Council of Ceylon of 11 February, 1704. At the meeting it was discussed "whether or not to hold up the *Yachtlet De Pool* any longer . . . Since, to the surprise of the Governor and council, there had been not the least news from Surat since the previous November." The implication was that the annual pay ship for the Dutch garrison of Ceylon, carry-

ing silver from the Surat mint, had been lost in 1703 or '04.

Yet if the silver had belonged to the East India Company, one would expect it to have been marked with the VOC mark. These coins were not so marked. Another disquieting factor was Commander Peterson's identification of the two small cannon or swivel guns found in 1961. These, he felt, were almost certainly of Eastern manufacture.

The purpose of our small expedition was to identify the ship. If she proved to be European, there was a good chance that we might find records describing what had been on board when the ship sank. My previous experience with shipwrecks had led me to believe that even smashed wrecks on rocky bottoms should have bits of the hull which might make it possible to determine where the ship had been built, and that, lacking concrete evidence from the wood, there would certainly be glass and pottery which might identify the wreck.¹

¹I am very grateful to the Director of the Department of Antiquities, Dr. C. E. Godakumbure and his assistant, Dr. Roland Silva, for their assistance and for the department's permission to export small samples, of no intrinsic value, for analysis.

We were given permission to set up our camp at the base of the Imperial Lighthouse Service at Kirinda, ten miles from the wreck, through the kindness of Mr. F. E. Rees, MBE, Superintendent of the Service in Ceylon. There we were greatly assisted by the lighthouse superintendent, Tuan M'hamed Buhar Hamin, and the lighthouse crew, who allowed us to camp in their boatshed and use other facilities of the base.

Our crew consisted of Michael Wilson, Arthur Clarke, Rodney Jonklaas, their Singalese assistants, and myself. We had a 25-foot motor launch especially prepared by Wilson for the expedition, and the usual diving equipment. Two rubber dinghies were particularly useful for working over the wreck site.

Although this was the calmest season of the year, big seas still broke on the reef just outside the wreck area. At first we tried to approach from the sheltered side, swimming nearly a hundred yards through a gap in the reef. This was impractical, and so we then anchored the launch several hundred yards outside the reef with a good length of chain, and dived from the rubber dinghies which could be safely handled even at the beginning of the break.

The first task was to make a rough survey of the site. This was difficult because breaking seas set up such strong currents that an unwary diver, unless tied to the bottom, could be swept thirty or forty feet in either direction. Even in the thirty feet of water at the deepest end of the wreck area it was difficult to remain in one place. An accurate triangulation of the kind carried out on the Methone wrecks (*Expedition*, Winter 1963) was impossible. The only workable method was to measure the conspicuous objects in the wreck area, measure the distances between them, and make overlay photographs to consolidate the measurements.

Little was visible through the heavy growth of coral which had formed over the remains of the wreck, which lay in a channel between 15 and 20 feet wide, formed by two ridges of coral rock running east and west. Four anchors, standard equipment on the forecabin of a ship of the period, were lying together at the east end of the gully. They were 13 feet long by slightly under 13 feet across the flukes, and lay 120 feet from the bronze gun at the west end of the gully where the silver had been found. Among the anchors were four iron cannons, much overgrown. Between the anchors and the bronze cannon were two groups of iron cannon. One group was of three cannons and the second, 15

feet east of the bronze gun, contained 14 cannons. Slightly to the north of the large group, lay a larger gun. The short guns were difficult to measure, as they were very heavily overgrown, but they were all between eight and eight and a half feet long. The large gun measured over ten feet. It is unfortunate that we could not raise and clean one of the guns, as this would have given a good idea of the provenance of the ship.

Assuming that the area of the bronze cannon and silver coins is that of the stern of the ship, we can assume the ship to have been something over 100 feet long. This corresponds fairly closely to the specifications laid down in 1697 by the Central Board of the Dutch East India Company for a standard third-rate Indiaman of 130' x 33' 6½" (Amsterdam feet), to be armed with 26 guns. There are several 17th century illustrations of *fluyts*, which were round-sterned, flat-bottomed, and relatively narrow.

In *The Ship*, B. Landstrom has reproduced a contemporary drawing of a *fluytship*. She has 22 guns, 16 of them on the main deck, the others on a higher half deck aft. It is tempting to propose that our wreck was a ship of this type, and that the large heap of cannons came from the after end of the ship, where cannon were



PETER THROCKMORTON gave up operating and owning small ships and commercial diving in the Pacific to study cultural anthropology; this interest in people combined with his interest in diving led him to the study of Aegean sponge divers. Two seasons on Turkish sponge boats resulted in the discovery of dozens of ancient shipwrecks including the Bronze Age ship at Gelidonya and the Late Roman ship at Yassi Ada, both the subject of subsequent "excavation" by the University Museum. He has worked almost full time at underwater archaeology since 1958 and has been associated with the Museum since 1960. His book *Lost Ships*, tells of the Turkish sponge divers and the University Museum's first steps in Underwater Archaeology.

concentrated. There is, however, a possibility that these guns were ballast, as the largest cannon balls found were eight-pounders, four inches in diameter, and the length of ten feet of the large gun seems long for an eight-pounder, though the shorter guns can well have been six- or eight-pounders.

Once a rough sketch plan had been made, we had a fair idea of what had happened to the ship. Running at night or perhaps in bad weather towards the land, she would have been close to the breakers before her lookouts saw anything. Perhaps there was time for an attempt to come about, and she missed stays, to go broadside onto the reef. The breakers lifted her over the first line of reef, to lodge in the valley between reefs. The pounding surf must have smashed the wooden hull to pieces in a very short time. The heavy cannon and anchors fell through the disintegrating decks to lodge in the ravine, which was just large enough to contain the sunken ship. The upper works washed onto the inner reef, where the small swivel guns were found, and bits of wreckage probably washed right over the reef. The material from the after cabin and from the gun room and lazarette under the cabin, landed in the area of the bronze cannon and the masses of coins. Much of this material was held in place by the bags of silver.

There can have been few survivors, since life is not possible on that savage reef which lies ten miles from the nearest land and is continually swept by great seas. If, however, she was the *Overness*, someone survived to provide the information about her sinking which is in the report of the Governor's Council.

We then began to work in the area around the bronze cannon. The bottom was a solid mass of concreted material held together by sand, coralline growth, and diffused corrosion products of iron, making a mass hard as cement. It was full of ballast stones, silver coins, bits of splintered planks of several sizes, some probably ship's planking and others perhaps boxes which held the sacks. The area was full of the remains of iron ship fittings, cannon balls, iron nails, and pistol and musket barrels. The cast iron cannon balls had retained their shape, although greatly oxidized, sometimes so much so that they were feather light. There were grenades with their wooden stoppers still in place, although the iron was fragile as pottery.

The ship had been iron fastened with two centimeter square and four centimeter (diameter) round forged iron nails. These had corroded into a black mush contained by a surrounding mould of sea growth. The corroding iron had stained

the whole mass black, and it smelled strongly of pitch and gunpowder when raised. The general effect was very similar to that of the Cape Gelidonya wreck which, although nearly three thousand years older, lay on the same sort of bottom. The technique of jacking up lumps of concreted material proved as effective as it had at Cape Gelidonya. When we had removed a good deal of the overburden of concreted material from the cannon, we jacked it free, then raised it with the help of a plastic balloon. On shore we found its wooden tampon was still in place. The gun measured 4' 7" long, and was marked 23 23 8 on its breech.

Freeing the cannon loosened other material, and we broke out hundreds of pounds of lumps. These contained a fair sampling of material from what must have been the after end of the ship: a pair of matched flintlock pistols with brass thimbles, the stocks in good condition and the barrels badly corroded; the forearm of a musket; a pewter decanter stopper; bits of broken blue and white china and other sherds; a bronze pestle; one gold-washed brass earring with green glass pendants; a bit of a green glass bottle; a piece of bone too small to be identified; the brass buttplate of a musket, pistol and musket balls; and a silver-plated copper salver. Mixed in with the mass, like straw in bricks, were pieces of the coconut fiber bags in which the silver had been carried, probably a thousand coins to the bag, and fragments of bamboo mats. Every lump was full of silver coins, always rupees and half rupees of Aurangzeb, which had scattered through the wreck when their bags rotted. It was remarkable how much material had remained in approximate archaeological context after the wreck broke up, despite the site's exposed position directly under monsoon waves for the better part of every year.

After two weeks we left the site, having raised a good sampling of material in order to identify the wreck, together with several hundred pounds of silver. We concluded that the intrinsic value of the silver, though there might be a great deal of it on the wreck site, would not justify the cost of excavating it. The wreck is, however, of considerable historical interest and ought to be further explored.

On returning to Athens I began a correspondence with various experts in an effort to identify the wreck. Commander Mendel Peterson of the United States National Museum wrote that the brass cannon was probably English. The marks on the breech indicated hundredweights, quarter hundredweights, and individual pounds. The National Museum's firearms expert, Mr. C. G.

Goins, examined the pistol stocks and concluded that they were characteristically English or German.

Dr. N. M. Japikse, archivist at the Algemeen Rijksarchief in Holland, wrote that there had been three ships named *Overness* in the service of the Dutch East India Company between 1697 and 1776, and that there was no mention of the loss of any of them. We turned to the list of British East India Company ships lost between 1702 and 1719 and found that there had been 14, all about the right size, but none lost near the Basses and none with 22 guns. The sites of loss of two of these ships were unknown. One was sailing east from Bengal and could not have gone near the Basses. The other, the *Glocester Frigot*, 350 tons with 70 men and 30 guns, commanded by Phil Browne, sailed from Plymouth consigned to Bencoolen on 30 September, 1702, and apparently went missing. Another possibility was the *Albemarle*, 330 tons, 66 men, 30 guns, commanded by William Beavins. She sailed on 31 January, 1704, with a cargo worth 20,386 pounds 9 shillings, and was said to have been lost at "Balparro."

Samples of wood from the wreck were sent to U.S.D.A. Forest Products Laboratory, where they were studied by Mr. J. Francis Kukachka. His analysis of this material suggests that the ship was fitted out in Southeast Asia, possibly even built there. The stopper from the brass cannon muzzle was teak, as were stoppers from the iron grenades, fragments of broken chests, and the musket forearm. Not surprisingly, the pistol stocks were of European walnut. A fragment that might have been part of the ship's planking was also Asiatic wood. This makes it unlikely that our ship was a British Indiaman, for these vessels were almost always built and fitted out in England.

Mr. M. P. H. Roessingh, who has undertaken the task of searching through the hundreds of manuscript pages of the Dutch East India Company's records, suggests that the ship might be a Moorish vessel from Surat, which would explain the lack of a VOC (Dutch East India Company) mark on the coins, the oriental guns, and the evidence that the ship was fitted out in the East. Yet if the Basses wreck was a local ship, why the European matched pistols, the pewter decanter, the bottles and china? It seems also unlikely that a Surat trader of the period should have the typical armament of an Indiaman. At this writing the origin of the ship remains a mystery which will probably be solved through further research.

Another kind of research on material from the Basses wreck has been done by Mr. Richard Russell, a chemist who examined some of the lumps of coins and the black "cement" which held the larger lumps together, at the laboratory of the Geological Institute in Athens. His microscopic examination of the encrustation revealed sand particles cemented together with calcium carbonate. The sand was made of particles of quartz, rose quartz, garnet, and a few that resembled rubies, all water worn. Some of the lumps contained a few very small bits of obsidian, with conchoidal fractures and razor-sharp edges. He proposes that they might have been laid down when Krakatoa exploded in 1883. This sand made up 32% by weight of the encrustation.

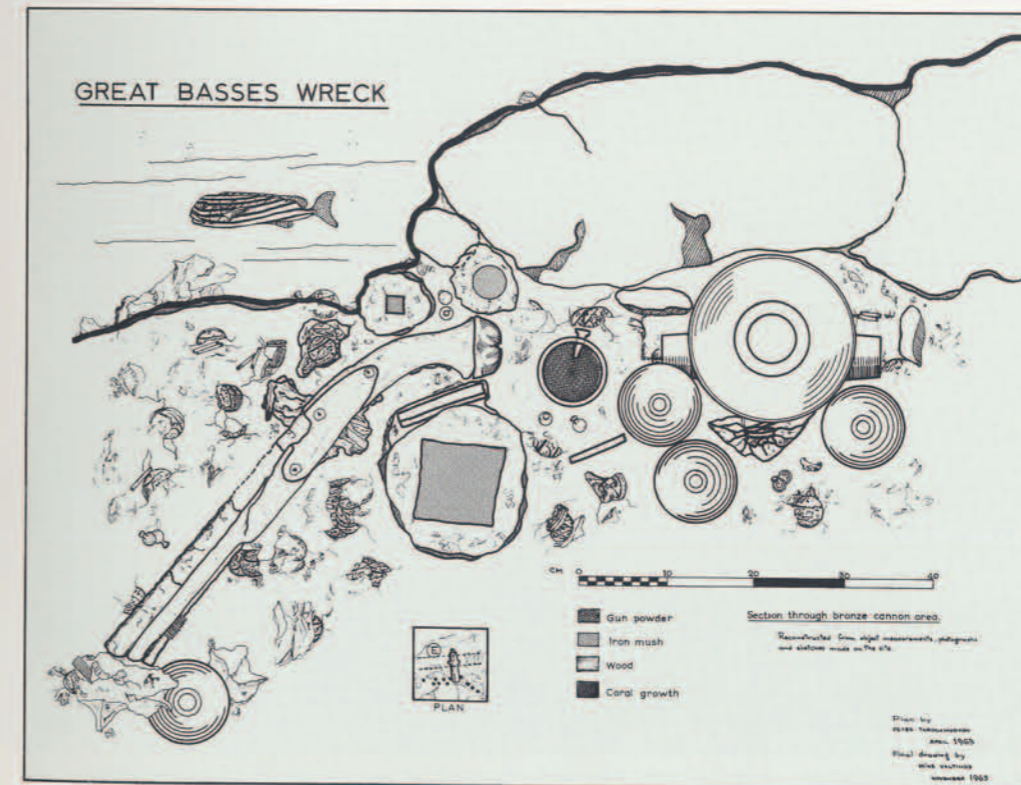
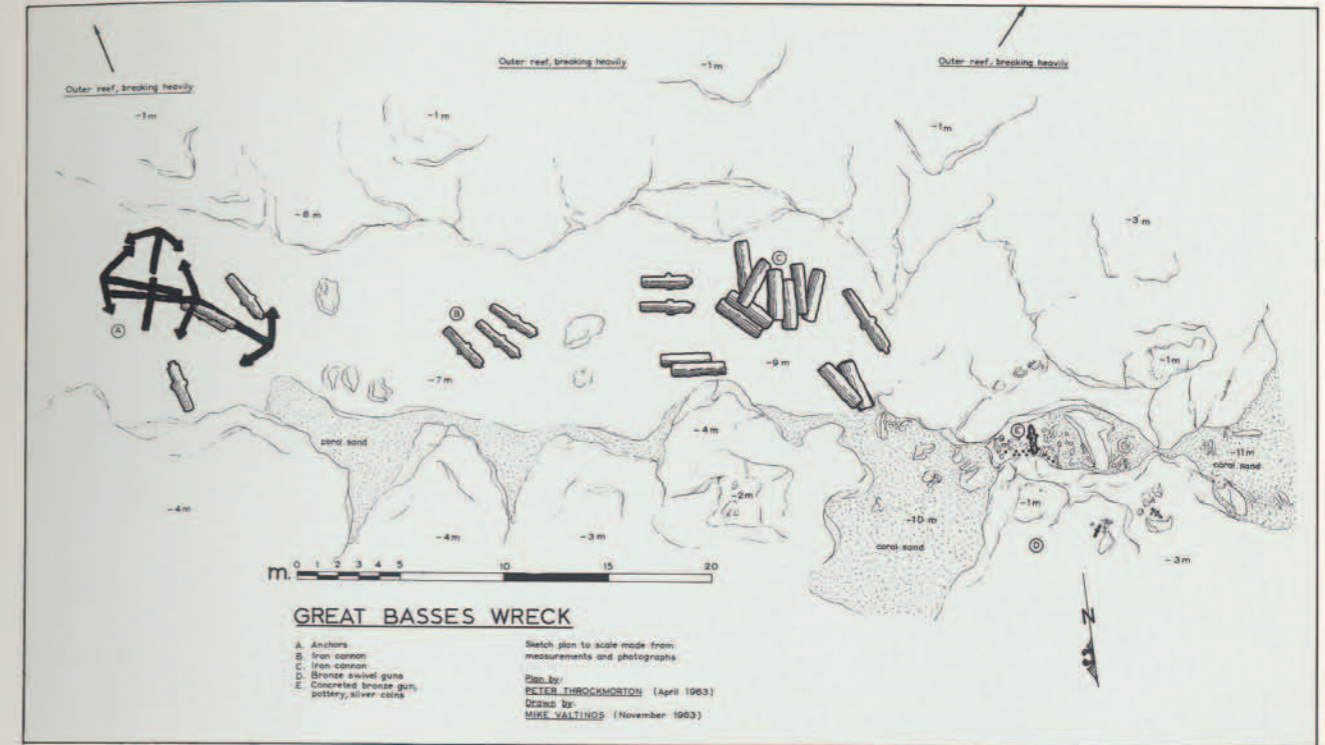
The black stains were from hydrated iron oxide, and the silver had been blackened by a coating of silver sulfide. He concluded that metallic iron in a wreck does not simply oxidize as it would on land, and that the wreck area was infected with sulfate reducing bacteria whose action led to the production of quantities of iron sulfide in the lumps. Mr. Russell is now at work on a large lump of material from the wreck, and his research should result in extremely useful information about chemical processes which occur in a shipwreck, particularly relevant to problems of preservation.

Some interesting conclusions can be drawn from the Basses wreck. Although it lies in a very exposed position, enough organic material survived so that analysis of it is possible, and, as at Gelidonya, many small objects survived intact. Although the ship must have been smashed to pieces immediately after sinking, some information about her construction was obtained and a full scale excavation would certainly reveal more constructional details as well as more material to identify the ship.

Whether she was Dutch, British, or Moorish, the wreck yields the kind of information seldom preserved in archives. Further work on her will throw new light on one of the most exciting periods of modern history, those years when European merchant adventurers were opening the closed gates of the East to European thought and trade.

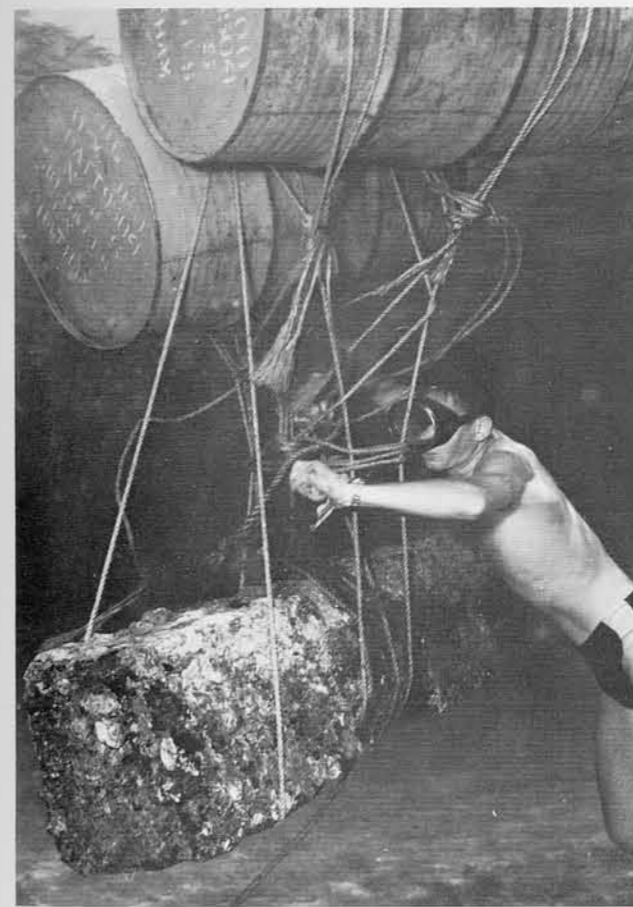
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 C. R. BOXER, "The Dutch East Indiamen," *Mariners Mirror*, Vol. 49, No. 2. 1963.
 PETER THROCKMORTON and JOHN M. BULLITT, "Underwater Surveys in Greece: 1962," *Expedition*, Vol. 5, No. 2. 1963.





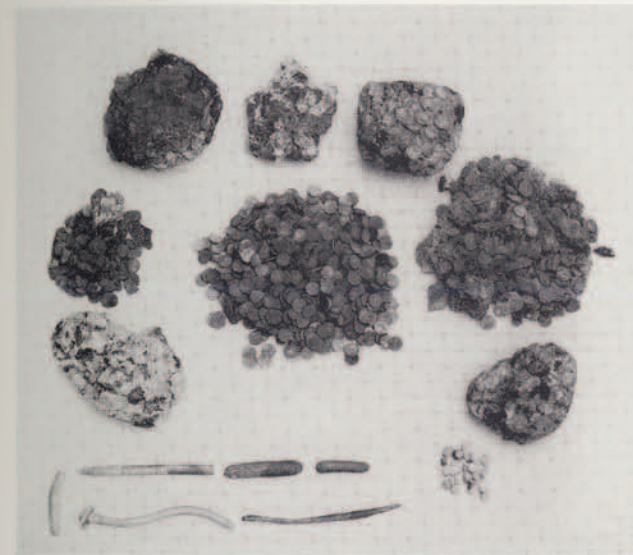
The Great Basses reef, consisting of several miles of rocks just below the surface of the water, lies about seven miles from the south coast of Ceylon which can be seen in the background in the top picture. The site of the wreck on Swami Rock could be approached only by rubber rafts.



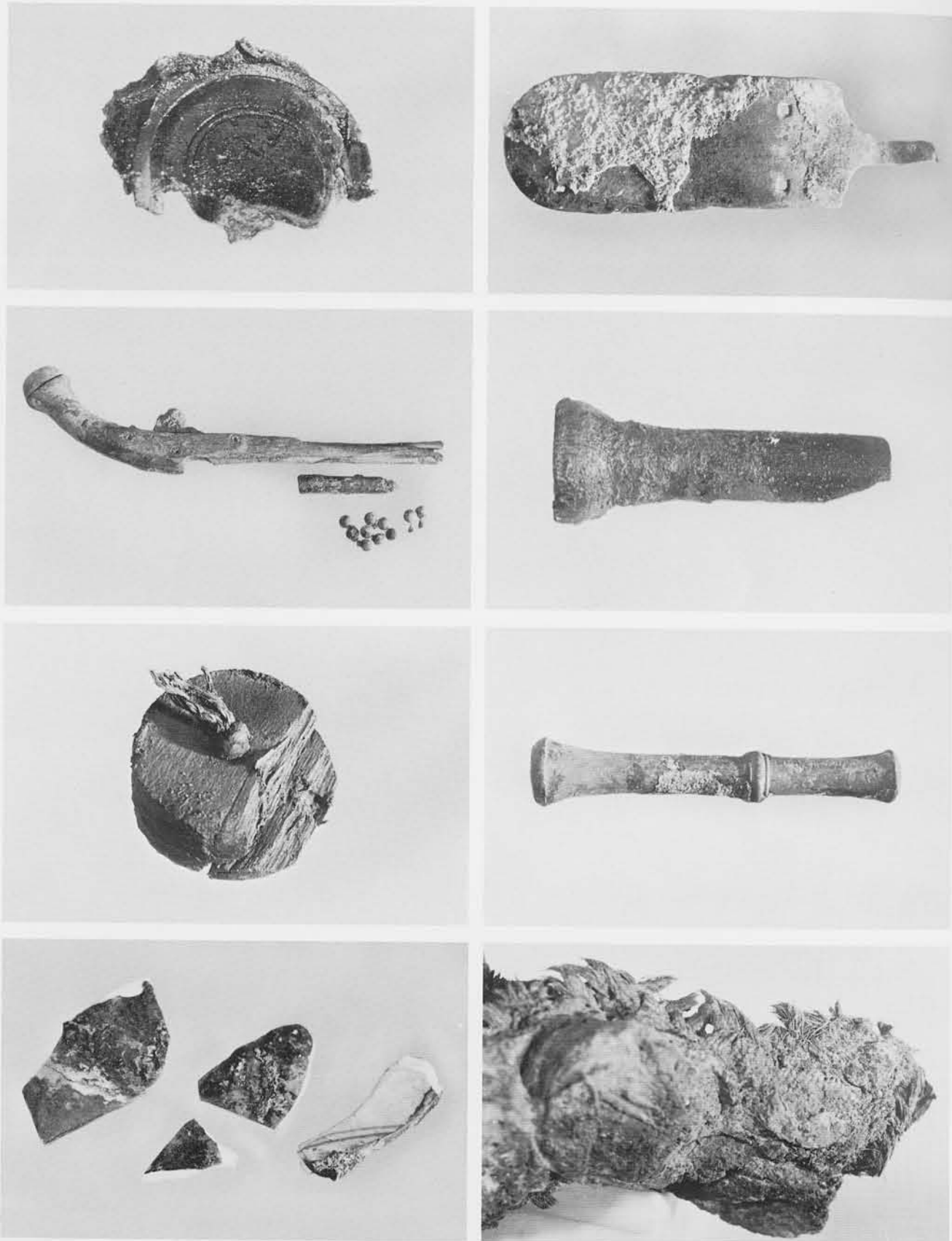
Architectural fragments from some great building recovered at Swami Rock in 1962 are examined under water, cleaned, then floated to the surface with the aid of empty oil drums.



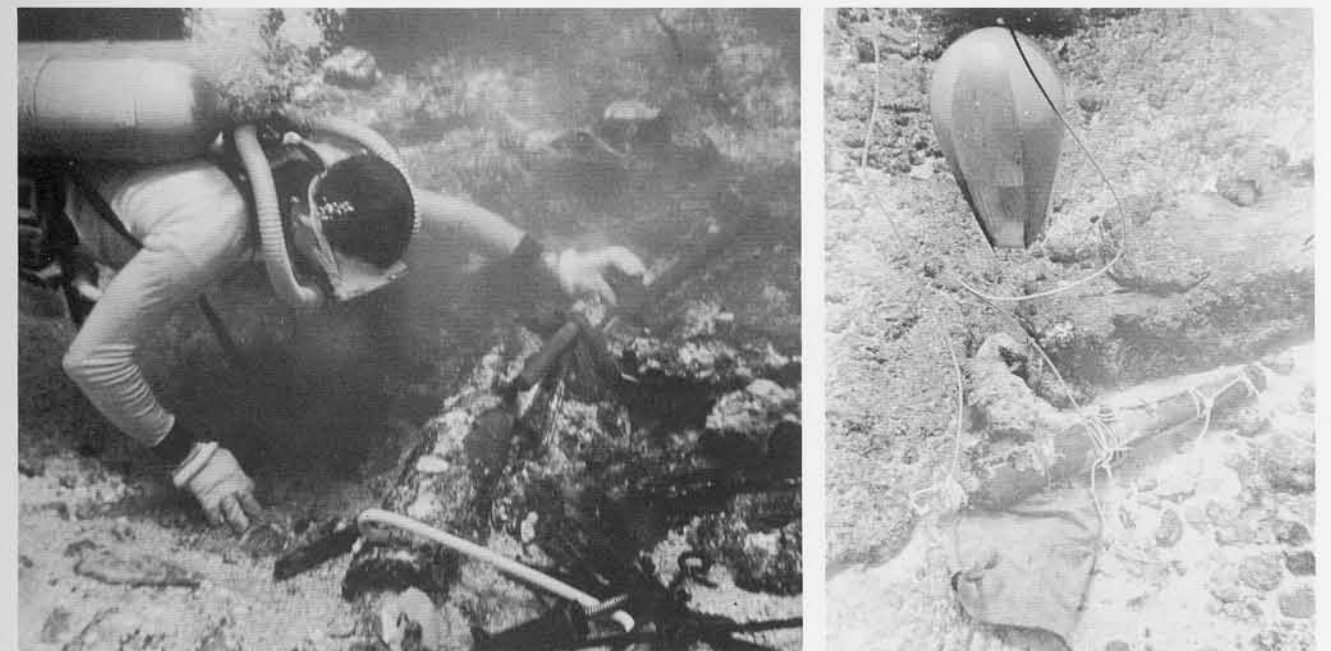
Peter Throckmorton, wearing a boiler suit to protect him from the sharp coral, chipping out growth which covered the larger bronze gun, to be seen to his right. The area to right and left of the gun is a solid mass of concreted material from the ship.



Silver treasure to the weight of 120 pounds was recovered in 1961. (Upper left) The 1000-coin masses at the moment of recovery. (Upper right) Mark Smith (right) and Bobby Kriegel at the lighthouse on the same day. (Left center) Of the masses of coins, the one at the top right of the picture is now in the Smithsonian Institution in Washington. (Bottom left) The coins in the Smithsonian. (Bottom right) Mike Wilson and Peter Throckmorton examining the coin masses.



(Left, top to bottom) Pewter cap for a decanter. The walnut stock of one of the pistols, part of its barrel, lead pistol and musket balls. The teak tampon of the large bronze gun. Blue and white china. (Right, top to bottom) The butt plate of a musket. Teak tampon for a grenade or shell. Bronze pestle. Remnants of the bags which held the coins.



(Top) The two small cannons (swivel guns) raised when Mike Wilson found the wreck. The upper gun uncleaned. The lower gun's shiny surface, polished by sand, led Wilson to the wreck. "An Historical Relation of the Island Ceylon" published in 1681 in London, flanked by sacks of silver and miscellaneous coins. (Lower left) Mike Wilson working to raise silver lumps. (Lower right) Raising the bronze gun which weighed 331 pounds cleaned.