

A FAUNAL ANALYSIS OF THE 17TH CENTURY GALLEON

NUESTRA SENORA DE ATOCHA

by

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ABSTRACT

The vertebrate faunal analyses of the 17th century sunken Spanish galleons, Nuestra Senora de Atocha and to a lesser extent, the Santa Margarita have yielded relevant information on the transportation of animal types across the Atlantic. The collection from the Atocha includes 986 identifiable bones, which mainly consist of various fish, reptiles and mammals, although a few bird bones are noted. Remains were collected from 16 areas either within what was left of the ship, or in sections measured away from the wreck.

Evidence has shown that a few animals, namely Sus scrofa and Ovis/Capra, had been consumed during the voyage, due to cut marks and/or burned areas. Fresh fish were also a major food source on board ship. Other species were transported alive for use as breeding stock, curiosities for European zoos, or as commodities. Hence, this assemblage provided important information about human-animal interactions aboard such sailing vessels.

manifests, their date and rough time of departure from Cuba, as well as the precise date of when they were lost. Hence, there would be no external intrusiveness into the wreckage, except for an occasional dying sea creature. The heavier artifacts would remain relatively undisturbed in the same place in which they settled after the initial sinking, while the lighter weight artifacts could be moved around to some degree, within the same general area (Mathewson 1986). Thus, when these 17th century Spanish ships were excavated, clues were revealed as to individual cultural backgrounds, wealth, status, and subsistence strategies. The artifacts (gems, metals, utilitarian ware, olive jar ceramics, animal bones, etc.) which yielded these clues were recovered from the sandy ocean sediment by Mel Fisher's Treasure Salvors Incorporated in 1985.

Much of the artifact retrieval was done using airlifts and venturi pumps to suction up the cargo trapped in the ship's hull structure, and to a lesser extent by fanning sand from the bottom and manually collecting the materials. This was done in favor of mailboxes which would blow the site apart and thus make mapping and controlled archaeological excavation impossible. The decisions as to where to use the airlifts were made based on surveys with metal detectors (Mathewson 1986).

The retrieval yielded a large quantity of animal bone for analysis which was forwarded to Professor Stanley J. Olsen, in 1988 by Dr. Robert Pickering. Dr. Pickering, formerly of the Field Museum of Natural History is now the Curator of Anthropology at the Children's Museum in Indianapolis, Indiana. Prior to shipment, the faunal material was

CHAPTER TWO

HISTORICAL BACKGROUND

Following the travel route known as the *Carrera de Indias* various Spanish ships helped in establishing the extensive trade network that bridged New Spain to the European continent. By the mid-sixteenth century, all ships involved in carrying the precious cargoes that would be used to help finance Spain's war against the German principalities, needed protection from Dutch raiders, hence, they sailed in escorted convoys. Eventually these convoys began to make regular biannual trips, thus converting themselves into scheduled fleets. The New Spain fleet consisted of a convoy sailing from Veracruz with silver, dyestuffs and spices from Mexico, as well as the Manilla galleon convoy which was loaded down with silks, gold and porcelain. The *Tierra Firme* fleet, of which the Nuestra Senora de Atocha and Santa Margarita belonged, contained the wealth from the mines of Peru and New Granada (Figure 1). Smaller ships which collected cargoes around the Caribbean and a flotilla from Honduras would make their way back toward Havana, in order to join up with the others for the voyage home (Lyon 1976, 1979; Mathewson 1986).

Heavily armed escort galleons were provided to guard these fleets, with at least one lead ship, a *capitana*, and a rear guard, an *almiranta*. With an increasing need for the wealth pouring out of New Spain, new ships were required for the retrieval. Hence, in 1616 Captain Alonso Ferrera was contracted by Spanish averia officials (a branch of the House of Trade in Seville) to build four 500-ton guard galleons in his Havana shipyard. These new galleons were to be 110 feet in overall

length, 33 feet wide and draw 14 feet of water. They would carry square sails on the fore- and main-masts, to more effectively gather wind speed, and for protection each would have the ultimate weapons system of the time. Each ship would mount twenty to twenty-four bronze cannons, most situated on the gun deck, one level below the main deck. In addition, the ships were to be furnished with five large anchors and one smaller one, a launch and a full set of sails and rigging (Lyon 1979).

The Nuestra Senora de Atocha (Figures 2a & b), completed on August 16, 1620, was an impressive 600-ton galleon, carrying 20 cannons. Departing from Havana on her maiden voyage to Sanlucar, the Guadalquivir port of Seville, she however sprung several serious leaks in the bow section, which required repairs that would delay her arrival in joining the Tierra Firme (mainland) fleet. Finally, the fleet, led by Commander Lope Diaz de Armendariz, the Marquis of Cadereita, departed Spain on March 23, 1622, and arrived at Portobello on the Isthmus of Panama on May 24. Seven Guard galleons, including the Santa Margarita sailed from Cadiz on April 23 and arrived at Dominica Island on May 31. The galleon's cargoes from Spain consisted of wine, cloth, ironwork, books, papal indulgences and a half million pounds of mercury used to extract silver from ore (Lyon 1976).

While in Portobello, the Marquis acquired another galleon, the Nuestra Senora del Rosario, after hearing of 36 Dutch warships sighted off the north coast of Venezuela. Quickly the flota left for Cartagena, arriving on July 27, where gold, silver coins and bars, and tobacco were loaded aboard in abundance. Sailing for Havana on August 3, the ships did not arrive until August 22 due to calm windless days, a sign that

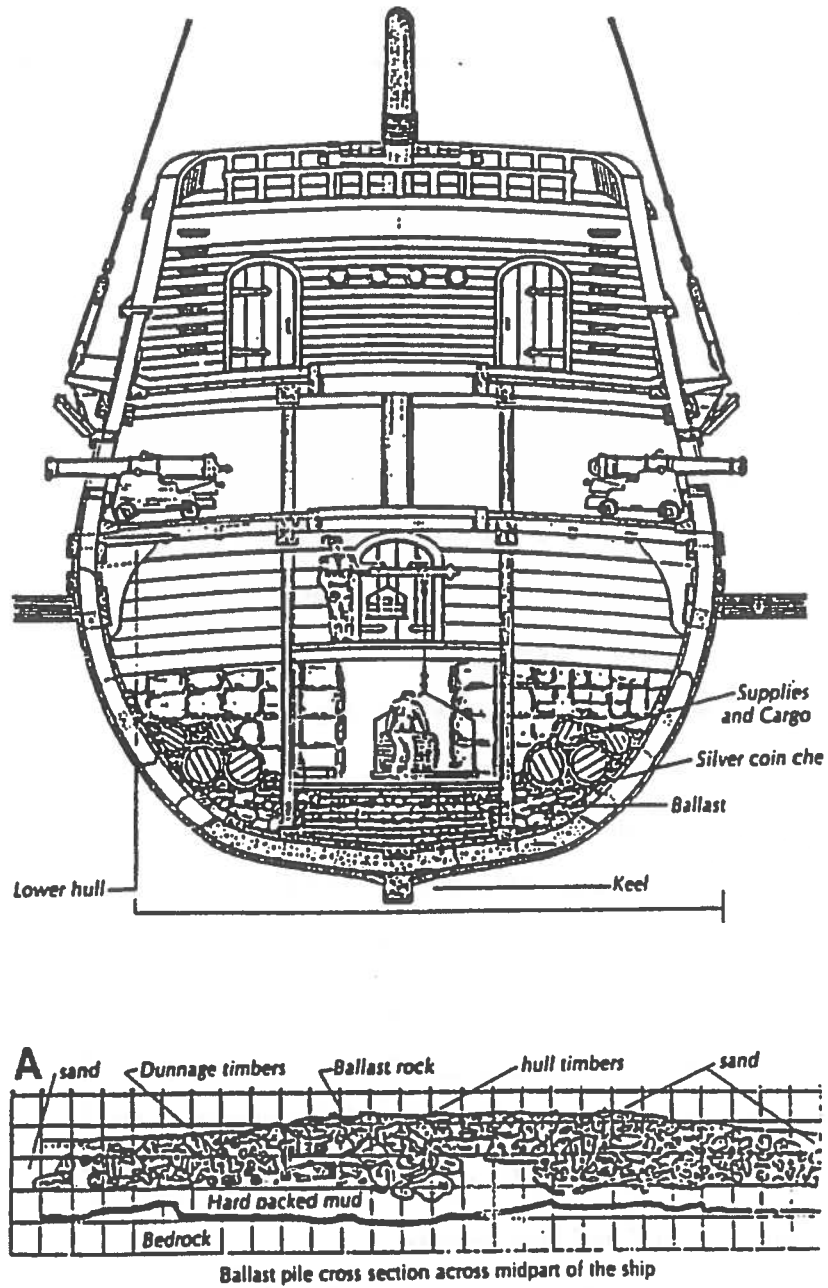


Figure 2b. A cross section of the Atocha showing where the various cargoes were stored. (Mathewson 1986).

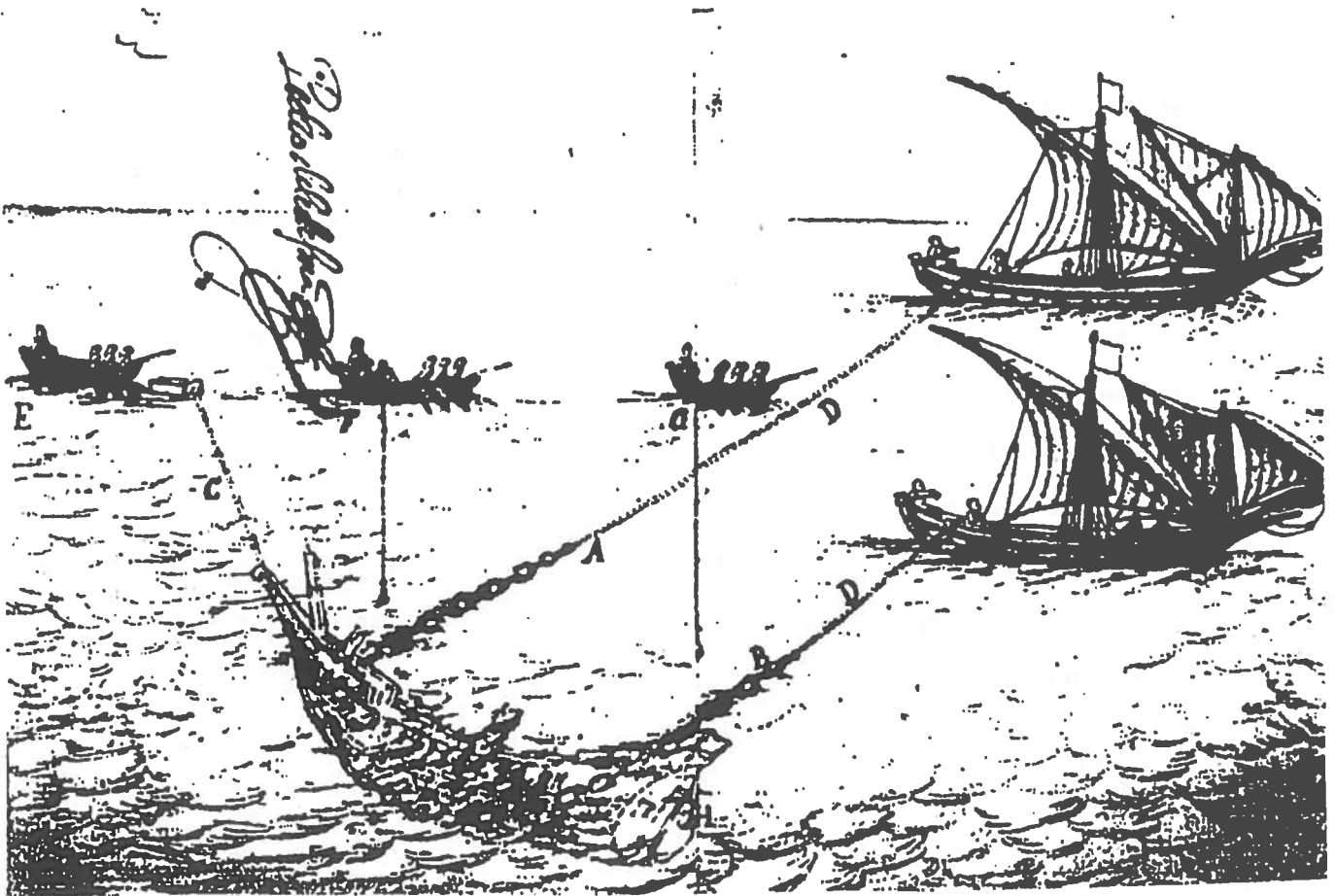


Figure 3. A salvage technique of dragged chains and lowered grappling hooks to ensnare possible wrecks. Gaspar de Vargas used this method in his attempts to discover the Atocha. (Mathewson 1986).

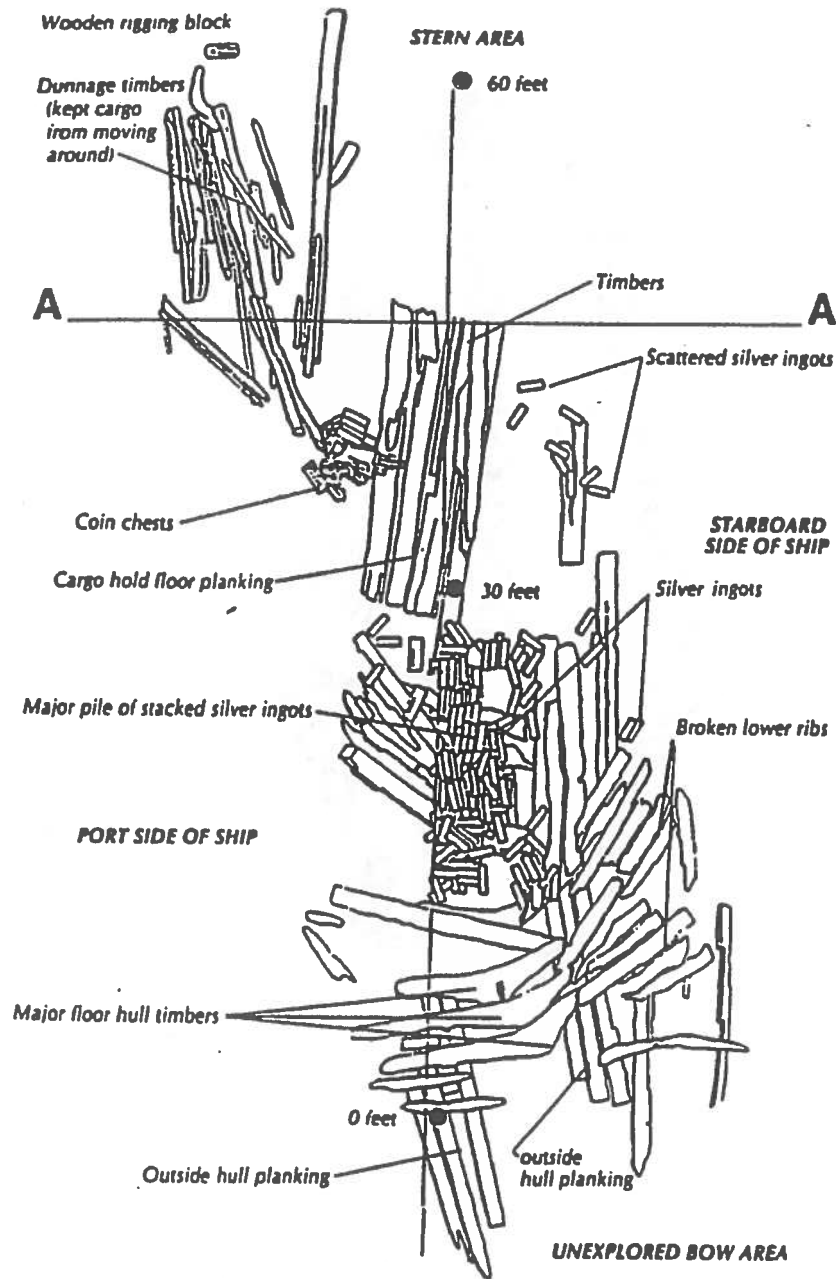


Figure 4. The Atocha as she was discovered by the Treasure Salvors, Inc., and mapped. The scattering of the lower frame elements reflects the impact of the ship against the reef areas. (Mathewson 1986).

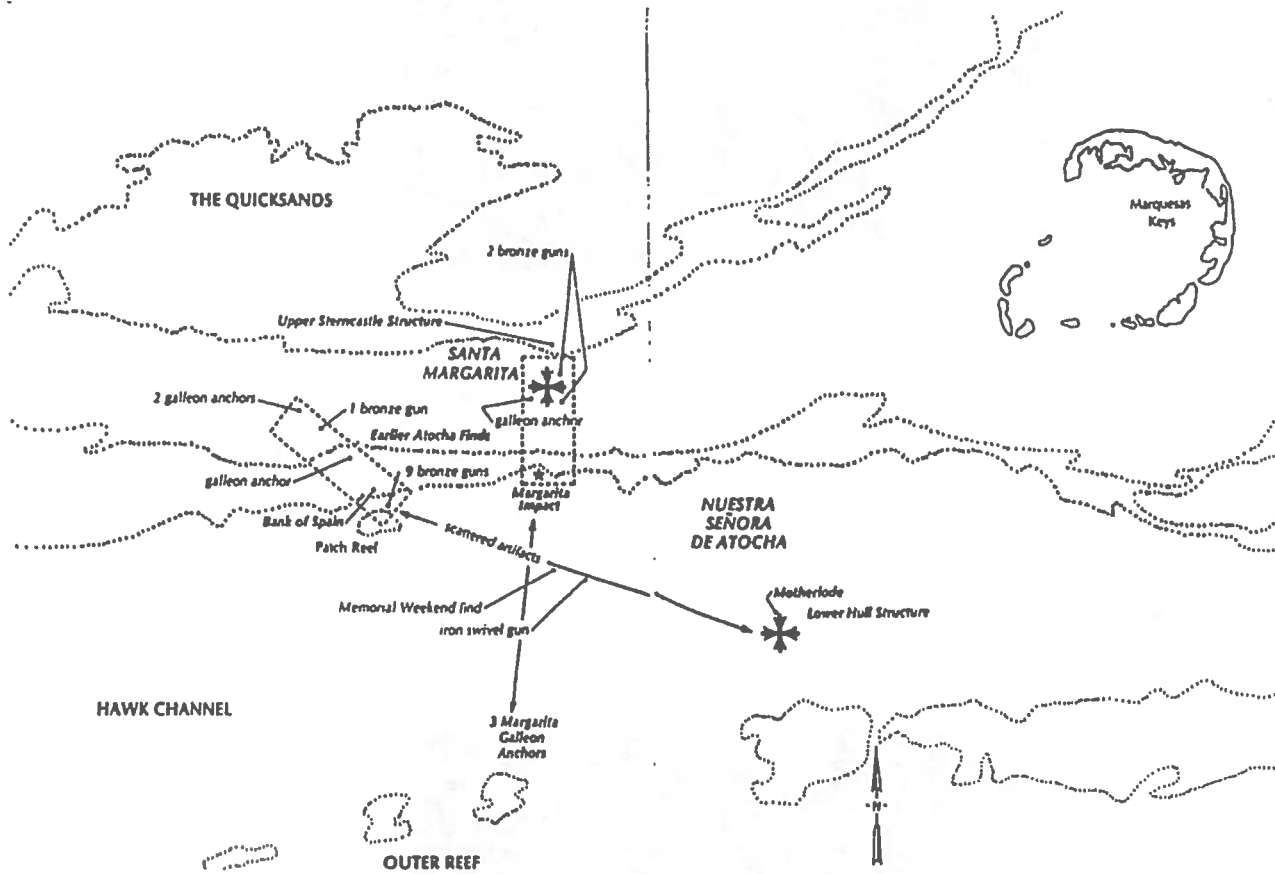


Figure 6. A schematic map of the sinking and break-up of the Atocha and Santa Margarita. (Mathewson 1986).

pottery sherds, and a whole range of materials for everyday use were brought to the surface. These simpler artifacts, and in the case of this paper the faunal remains in particular, will tell archaeologists a great deal of what life was truly like aboard sailing vessels during the 15-18th centuries.

	Energy (calories)	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Calcium (mg.)
<i>Meat Days (19 per month)</i>					
Biscuit (1.5 lbs.)	1,639.50	62.00	17.70	335.40	571.50
Wine (2 pts.)	1,007.00	1.00	0	54.00	77.00
Rice (1 oz.)	102.94	1.90	0.11	22.79	6.81
Chickpeas (1 oz.)	102.06	5.81	1.36	17.29	42.50
Salt pork (6 oz.)	1,278.80	6.38	138.80	0	trace
Total	4,130.30	77.09	157.97	429.48	697.81
<i>Fish Days (9 per month)</i>					
Biscuit (1.5 lbs.)	1,639.50	62.00	17.70	335.40	571.50
Wine (2 pts.)	1,007.00	1.00	0	54.00	77.00
Rice (1 oz.)	102.94	1.90	0.11	22.79	6.81
Chickpeas (1 oz.)	102.06	5.81	1.36	17.29	42.50
Dried cod (6 oz.)	637.90	139.10	4.80	0	382.90
Olive oil (1 oz.)	253.60	0	28.40	0	0
Vinegar (2.67 oz.)					
Total	3,743.00	209.81	52.37	429.48	1,080.71
<i>Cheese Days (3 per month)</i>					
Biscuit (1.5 lbs.)	1,639.50	62.00	17.70	335.40	571.50
Wine (2 pts.)	1,007.00	1.00	0	54.00	77.00
Rice (1 oz.)	102.94	1.90	0.11	22.79	6.81
Chickpeas (1 oz.)	102.06	5.81	1.36	17.29	42.50
Cheese (6 oz.)	630.68	37.84	51.99	3.24	1,244.32
Olive oil (.5 oz.)	126.80	0	14.20	0	0
Total	3,608.98	108.55	85.36	432.72	1,942.13
<i>Daily Average</i>	3,967.41	118.67	120.29	429.79	929.39
<i>Recommended Daily Allowance (moderately active male, 143 lbs.)</i>	3,000.00	37.00			400-500

Figure 8. A table listing the dietary requirements of seamen.
(Phillips 1986).

as evidenced by gnawing marks left on bones (Marx 1971; Armitage 1987). Bedbugs, lice and fleas abounded in people's beds, clothing, and on the livestock. Of course these infestations were not easily eradicated due to such cramped lodgings and a lack of proper sanitation, so the only thing passengers could do was to complain (Horner 1965; Phillips 1986). Worms and maggots were found in the rations, such as floating in the broth or taking up residence inside spoiled biscuit. Indeed, on Columbus' fourth voyage, his crew supposedly ate their meals at night so they would not have to see what they were eating (Phillips 1986). Cockroaches got into everything as well, i.e. the ship's stores, and passengers' cabins. Wherever left over food could be found, these vermin would be present.

The most annoying creature on board however, had to be the black rat. It was a reluctantly included passenger aboard every type of ship. Rats generally spoiled fresh water by falling into the barrels and drowning; they gnawed through jars, sacks and wooden barrels thus ruining the food supplies; and they invaded the chicken coops, killing the helpless birds and eating them (Phillips 1986; Armitage 1987). Many of the creatures themselves were killed though. During the 1622 fleet's stay in Havana, more than 1000 rats aboard one ship were killed, and another 3000 or so were destroyed before the remaining ships reached Spain. According to Phillips (1986), some rats were eaten by those who could actually stomach the idea. In fact, one British captain actually sold skinned and cleaned rats to his men for food (Milton-Thompson 1981). Supposedly once grilled and peppered, they tasted much like rabbit.

Besides rodent remains, further indications of what faunal remains could be expected on fleet ships comes from archaeological excavations of the 1554 Spanish shipwrecks off Padre Island, Texas, which uncovered the remains of fish, pig and turtle. The presence of part of a horn suggests that some of the meat was stored on the hoof (Arnold and Weddle 1978). In addition, there is documentary evidence available from two of the ships. The 220 ton Santa Maria de Yciar, carried provisions for the return voyage, considered sufficient for the 67 crew members and passengers. This included 5000 pounds of biscuit (bizcocho), two barrels of meat, probably pickled in brine, beans, olive oil and vinegar, and of course the diet could be supplemented with fresh fish. Other ship voyages contained similar food stuffs, but of a greater variety, such as salt pork and other meats, cheeses, beans and peas, sardines, flour and wine (Arnold and Weddle 1978). The Santa Maria also carried 1226 cowhides, registered in several different lots numbering from 62 to 400. "Dried and well conditioned, some with the hair removed" is how Arnold and Weddle (1978) describe them.

The most complete and descriptive provisional list available from the 1554 wrecks is that from the Nuestra Senora de la Concepcion. She carried sardines, anchovies, tuna fish, sugar, flour, raisins, 350 dozen eggs - all packed in barrels; 400 strings of garlic, wine in leather bags and casks, peas, beans, Valencian rice, cheeses, biscuit, slabs of bacon and ham, lentils, olives in earthen jars, 20 dozen small dog fish and 6 dried hake, and 20 butchered hogs. The Concepcion also lists eight hogs, five sheep and eight steers on the hoof, one of the earliest recorded accounts of live animals taken along for food and for their

skins (Arnold and Weddle 1978; McDonald and Arnold 1979).

The live animals were the last to board (Figure 10), and the crew received extra pay if they could keep the animals alive and in relatively good health by the time the ship reached its port of call. Turtles immobile on their backs, often had to have their heads, particularly their eyes, kept moist or else the animals would over heat and die. If a purchased animal died in route, the cost could often come out of the caretaker's salary (Olsen 1988).

Such animals loaded aboard ship included those available in New World ports, particularly in Central America. They consisted of cattle, sheep and horses primarily, however, other seaworthy creatures included ducks, capons, turkeys, roosters, hens, spring chickens, pigs, rabbits, goats and various kinds of fish (Hamilton 1934). When the Spanish first arrived in Central America, they found that their domestic animals, namely pigs and cattle, multiplied rapidly with little care. Sheep, goats and horses began to expand their ranges, but on a much lower level. Growing conditions were so favorable that by the middle of the 16th century, the Spanish had established extensive ranching operations, and cattle herds, swine and sheep flocks numbered in the hundreds of thousands (Chevalier 1963; Haring 1947). Horses could be had for not much more than it would take to break them.

Eventually, the growth period stopped and even started to decline. The reasons given for this were 1) the need for tallow in making soap and candles; 2) the need for leather hides to outfit the Spanish armies and 3) the fact that the region could not longer support such large herds due to ecological degradation and the increase in Spanish

commodities, as well as subsistence.

bone count, a minimum number of individuals (MNI) was deduced. The MNI is an estimate of the fewest number of individuals represented in a sample. This is done by pairing left and right elements, along with other remains of an identified animal, in order to establish a general number of animals present. From the recovered Atocha material, 107 MNI were accounted for, 23 of which were juveniles represented by some 76 separate elements. There were three avian animals: one turkey, one unidentified and one gallineaceous; and 20 mammals: two pigs, one cow, one sheep, one rat, one pig/sheep/goat, one possible deer, 11 sheep/goat, one sheep/goat/deer, and one general mammal.

The vertebrate faunal remains recovered from the Atocha represent a diverse assemblage comprised of animals whose presence aboard ship is the result of various activities including subsistence, breeding, commodities, curiosities for zoos and entertainment. For the most part, the vertebrate taxa recovered from the Atocha are quite similar, and in some cases, identical to the current faunal community of Central America and the Caribbean. Hence, the Spanish sailors of the 17th century had access to as wide a range of taxa as is known in the region today.

The presentation of the following taxonomic list of vertebrate fauna recovered will be supplemented by discussions of each taxon. The provenience for the greatest quantity of the vertebrate remains is listed in Table 2, and will also be discussed.

<u>Taxonomic List</u>	<u>Bone Count</u>	<u>MNI*</u>	<u>Juv</u>
Unidentified Turtle	4	2	
Class: Aves			
Order: Galliformes			
<u>Meleagris gallopavo</u>	4	2	1
Turkey			
<u>Gallus gallus</u>	6	1	
Chicken			
Gallineceous (gen. et. sp. indet.)	3	1	1
Chicken-sized (guan, currasows)			
Unidentified Bird	2	2	1
Class: Mammalia			
Order: Cetacea			
Porpoise (gen. et. sp. indet.)	1	1	
Order: Rodentia			
<u>Rattus rattus</u>	1	1	1
Black Rat			
Order: Perissodactyla			
cf. <u>Equus assinus</u>	1	1	
cf. Burro			
cf. <u>Equus caballus</u>	2	1	
cf. Horse			
cf. <u>Equus sp.</u>	2	1	
cf. Horse/Burro			
Order: Artiodactyla			
<u>Sus scrofa</u>	154	8	2
Pig			
cf. <u>Sus scrofa</u>	9		
cf. Pig			
<u>Odocoileus virginianus</u>	1	1	
White-tailed Deer			
cf. <u>Odocoileus sp.</u>	6		1
cf. Deer			
<u>Bos taurus</u>	58	7	1
Cattle			
cf. <u>Bos taurus</u>	6		
cf. Cattle			
cf. <u>Bos</u>	1		
cf. Cattle sp.			
<u>Ovis aries</u>	5	2	1
Sheep			
<u>Capra hircus</u>	4	2	
Goat			
** <u>Ovis/Capra</u>	176	24	11
Sheep/Goat			
*** <u>Ovis/Capra/Odocoileus</u>	31	2	1
Sheep/Goat/Deer			
cf. <u>Ovis/Odocoileus</u>	4	1	
cf. Sheep/Deer			
<u>Ovis/Capra/Sus</u>	1	1	1

CLASS: ANTHROPOD

From the remains present there is only one unidentified crustacean from the Atocha recovery. It was identified based on an undetermined number of claw fragments. Hence, the creature might have been crushed by debris when the ship wrecked, or later as the currents moved materials around the wreckage.

CLASS: CHRONDRICHTHYES

A single sting ray spine has been identified as belonging to the genus Myliobatis. This animal is definitely an intrusive, meaning that it was not aboard ship as a food provision, and even less likely was caught during the voyage.

Three undetermined shark centrum were discovered within the wreckage, but none of them had been altered in any fashion. During the 1622 voyage, haunches and slabs of meat were evidently being hung from the railings off the poop corridors where they were within range of sharks, as the ships rocked violently during the storm (Lyon 1979; Phillips 1986). Hence, sharks would have followed the ship hoping to get some free samples, but instead one could have found itself crushed when the ship went down. Another explanation is that a shark could have died within the wreckage over the years, or could have been caught while the crew fished just outside one of the ports. There is one reference in Arnold and Weddle (1978) to suggest that the fishing of shark was possible.

CLASS: OSTEICHTHYES

A total of 262 bony fish remains were recovered during the Atocha "excavation". Some osteological elements were derived from four known

(3/4 plastron and 1 1/4 carapace). A second Geomyda sp. has butchery marks on its shell and left humerus, indicating that it had probably been killed on board.

The remains of marine turtles are poorly represented, consisting primarily of upper limb bones of small individuals and these are badly eroded due to the rolling action of the sea. There are at least two possibilities as to their taxonomic assignment. First the green turtle, Chelonia sp. is a chosen, highly edible turtle and is found in the area that the Atocha travelled. The other genus is Caretta sp., not as popular as a food item, but since it is recorded from the same order it has to be considered. Both genera and their species have similar limb bones that cannot be separately defined on the examples that are represented from the galleon (Olsen 1988). Two pieces of plastron, belonging to two different individuals were burned, thus indicating that turtle had prepared at some point on the ship.

R. Duncan Mathewson III (1977) cites Lyon (1975) in his indication about the food provisions carried for the voyage. This included sea biscuit, flour, wine, vinegar, meats in casks, live turtles, chickens and water. These supplies were shipped in barrels, crates and ceramic storage jars. The reference to sea turtles and chickens for food is found again in Lyon (1976); and Phillips (1986) states that tortoises appeared frequently in Havana accounts, although the animals could have been slaughtered and their meat dried before sailing.

CLASS: AVES

A total of 15 bird bones (1.5% of the faunal collection) representing the order Galliformes are present in the Atocha assemblage.

of dog, seeing as how the early explorers always brought along large Spanish-bred dogs, in order to keep the natives in line. However, no such bones were discovered from either the Santa Margarita or the Atocha.

From the order Cetacea, one unidentified porpoise is represented. The only element available for identification is a fragmented centrum of a cervical vertebrae. This would indicate that this creature is an intrusive within the wreckage, meaning that it died there at some point before the ship was rediscovered in 1985.

Of the number of rodents discovered aboard other vessels in the 1622 fleet (3000-4000), only one juvenile Rattus rattus femoral bone was recovered from the Atocha. This could be due to the fact that seamen might have been eating a number of these rodents, as an extra food staple, or that most of the rats could have sensed the approaching danger and abandoned the ship prior to her sinking. Rats are known to swim at least 1/2 mile, and can tread water for up to three days (Canby 1977; Armitage 1987). Since the Atocha sank in relatively shallow water (55 feet), she would have been close to land, thus allowing the rodents to reach safety.

Other animals however, were not as fortunate. They were trapped in the upper hold areas and could not break free in order to swim for shore. Their bloated carcasses would have then fed multitudes of sea creatures (sharks, barracudas, fish, etc.) hence, some of the animals were probably eaten right after drowning, which would disperse their bones throughout the wreckage and within the local vicinity.

Discovery of a White-tailed Deer (Odocoileus virginianus) aboard ship seemed unusual. This animal was probably being transported to Europe for placement within a zoo. However, the animal was killed, as evident by cut marks on a few of the rib fragments, as well as the sawed antler tip.

Cattle (Bos taurus) are represented by a number of elements, namely vertebrae, ribs and an occasional femur and tibia. These bones contained the meatiest portions of the animals, which were preserved and stored in barrels. This preservation is indicated due to the number of butchery marks seen on the repetitive remains, as if the meat were being scraped off the bones in preparation for a meal. Ribs were the greatest quantity of elements recovered, so it would seem as though the midsection and hindquarters were the most favorable sections to carry on such a voyage. However, at least one Bos had been brought on board alive, as indicated by a recovered left mandible.

The sheep (Ovis aries) and goat (Capra hircus) were most likely being brought back to Spain for their wool, and milk producing abilities in order to make cheese. However, the number of individuals within the category Ovis/Capra would seem to indicate that many of the animals had already been slaughtered for food, while a few would be needed for commodities. It is very difficult to tell the difference between sheep and goat when examining a sea worn post-cranial element since these animals are roughly the same size and have comparable body weights. This explains why the majority of artiodactyl bones are grouped into this one category. It is also for this reason as to why there is an Ovis/Capra/Odocoileus category. Again, the limb elements are so similar

Table 2. Atocha Faunal Proveniences and Amounts

<u>Provenience:</u>	<u>Top Four Animal Types:</u>
<u>Surface Scatter:</u>	
158 bones	
51 burned	45 <u>Ovis/Capra</u>
2 cut	38 Mammal (general)
0 gnawed	25 Teleost
4 combination	12 <u>Geomyda sp.</u> (turtle)
(3 burned and cut; 1 burned and gnawed)	
1 unsure (burned/stained)	
21 juvenile pieces	
<u>Main Pile:</u>	
80 bones	
5 burned	27 <u>Ovis/Capra</u>
3 cut	27 Small mammal
5 gnawed	7 Mammal (general)
0 unsure	6 <u>Sus Scrofa</u>
0 combination	
8 juvenile pieces	
<u>Trench SW #3 Main Pile:</u>	
64 bones	
14 burned	42 Mammal (general)
1 cut	13 Teleost
0 gnawed	3 cf. <u>Sus scrofa</u>
39 unsure (burned/stained)	2 cf. <u>Craranx hippos</u>
0 combination	
4 juvenile pieces	
<u>No Provenience:</u>	
38 bones	
4 burned	20 <u>Ovis/Capra</u>
3 cut	7 Teleost
2 gnawed	3 cf. <u>Geomyda sp.</u>
0 unsure	2 <u>Ovis/Capra/Odocoileus</u>
0 combination	
3 juvenile pieces	
<u>Lower Hull:</u>	
205 bones	
5 burned	118 <u>Sus scrofa</u>
11 cut	23 <u>Ovis/Capra</u>
4 gnawed	11 <u>Bos taurus</u>
2 unsure (burned/stained)	6 Teleost
2 calcium carbonated	
7 combination (7 cut and burned)	
24 juvenile pieces	
<u>Lower Hull Ceiling Timber:</u>	
191 bones	

Provenience:

0 juvenile pieces

10ft. West of Baseline:

1 bone
 0 burned
 0 cut
 0 gnawed
 0 unsure
 0 combination
 1 juvenile pieces

SE Main Pile:

1 bone
 0 burned
 0 cut
 0 gnawed
 0 unsure
 0 combination
 0 juvenile pieces

Lower Hull SW #3:

29 bones
 1 burned
 1 cut
 4 gnawed
 0 unsure
 16 combination
 (1 cut and gnawed; 15 cut and burned)
 3 juvenile pieces

South of 1000 Mark Baseline:

45 bones
 7 burned
 3 cut
 2 gnawed
 0 unsure
 0 combination
 2 juvenile pieces

North of 1000 Mark Baseline:

93 bones
 4 burned
 0 cut
 0 gnawed
 28 unsure (burned/stained)
 1 combination (cut and burned)
 3 juvenile pieces

Top Four Animal Types:1 Ovis/Capra

1 Mammal (general)

23 Ovis/Capra
 2 cf. Bos taurus
 1 Sus scrofa
 1 Gallus gallus

32 Ovis/Capra
 8 Teleost
 1 Bos taurus
 1 Gallus gallus

48 Mammal (general)
 19 Teleost
 12 Sus scrofa
 6 Testadinata sp.

As an overview, these animals have contributed a great deal of data relevant to the study of subsistence aboard sailing ships of the early 17th century. The diversity of the fauna is in some ways matched by the multiplicity of uses to which these animals were put by the temporary inhabitants of the ships. The knowledge that will be gained from these remains provides archaeologists with historical facts that can be used in their conclusions about a past culture. Thus, these goods (i.e. metals, jewels, bones) preserved within these wrecks, are keys to a way of life that has been lost, but certainly not forgotten.

Of the 31 distinct genera of vertebrates identified from the Atocha, only ten are known without question to have been consumed by the ship's inhabitants, while an additional three genera are tentatively considered food animals. Thus, a maximum of 32% of the vertebrate genera recovered from this ship, mostly fish and mammal, appear related to subsistence behavior.

The recognition of an animal as a probable source of protein in the archaeological record is difficult though, without the presence of butchering marks and/or burning indications on a significant sample of the bone excavated. However, in this case, the discovery of an abundance of similiar elements (i.e. pig's femurs), would also indicate that such an animal was being utilized as a food source.

As expected, the animal group that seem to have been most heavily relied upon was that of the mammals. They constituted the overwhelming majority (67.01%) of the material recovered. Sample bias could strongly have affected this resulting proportion, particularly since much of the faunal recovery was done by visual reconnaissance and manual collection. Hence, medium to large-sized bones would more likely be noticed, indicating that 1) the Atocha was transporting a number of live animals, as seen from the skull fragments, teeth and foot elements recovered; and that 2) a good deal of the crew and passenger's diet consisted of red meat.

This last point is confirmed by the number of redundant elements that were discovered which seem to indicated how cut meat was brought on board the Atocha. The best preservation techniques of the time would not have been sufficient in order to keep the meat from spoiling during

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Table 3. Santa Margarita Faunal List of MNI

<u>E. caballus</u> : 1	Mammal: 2
<u>B. taurus</u> : 4	<u>Equus sp.</u> : 1
<u>E. asinus</u> : 1	cf. <u>B. taurus</u> : 1
<u>Bos/Equus</u> : 1	cf. <u>E. caballus</u> : 1
<u>S. scrofa</u> : 2	Medium artiodactyl (<u>Ovis/Capra</u>): 1
<u>Bos</u> : 1	TOTAL: 16

This table lists the minimum number of individuals (MNI) from the Santa Margarita, another of the ill-fated galleons sunk during the 1622 hurricane. This limited amount of material was delivered to Dr. Olsen for analysis, at the same time as the Atocha fauna. There is a total of 56 bones, representing 16 separate individuals. From this total seven juvenile pieces can be identified, belonging to three specimens. These include one Bos taurus, one Sus scrofa and one Ovis/Capra.

Only Bos taurus bones were modified in any form according to the analysis. Four bones (left humerus, right radius, right ulna and left innominate) had gnaw marks on them, two others (right femur and left tibia) were discolored due to oxidation, and one right tibia had a hole through its distal end. This list also contains two right Bos taurus horns, an undetermined number of rib fragments, and one shell fragment. There is no clue as to what happened to the left horns; perhaps they were overlooked in the recovery process.

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