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APPENDIX A

THE *CONCEPCION* COLLECTION AND ARTIFACT SUMMARY

The Manila galleon *Nuestra Senora de la Concepción*, the largest Spanish vessel of her time, wrecked on the coast of Saipan on September 20, 1638. Sailing from Manila to Acapulco, with a rich Oriental cargo, the ship and most of the four hundred passengers and crew were lost, drowned or were killed by the spears and slingstones of the Chamorro islanders. Five years of effort by Pacific Sea Resources, in partnership with the Commonwealth of the Northern Mariana Islands, have resulted in the research, recovery, conservation and documentation of the shipwreck's gold jewelry and artifacts, still remaining after contemporary salvage by local Chamorros and later by Spanish troops in search of valuable cannons. This project has been the first archaeological excavation of a Manila galleon, and the most significant historic project in the Mariana Islands.

The *Concepción* project was financed by Baring Brothers, the oldest merchant bank in England, Brian Chang, a well-known Singaporean industrialist, Per Bang-Jensen an American venture capital specialist and William Mathers, the Project Director. The historic research program was coordinated by maritime historian Sir John Hale, a trustee of the Victoria & Albert Museum in London. Technical assistance was provided by the British Museum, the Institute of Archaeology in London, and others. The sale of the Collection was coordinated by Christie's, the world's most respected auctioneers of shipwreck artifacts.

The Manila galleon *Concepción* served in one of the most enduring and lengthy commercial maritime routes ever. For 250 years an extraordinary assortment of Oriental goods such as gold jewelry, silks, spices, porcelain, ivory, furniture and exotic perfumes were traded for New World silver, an exchange that connected suppliers in the Far East with royal courts and households of Europe. In the grueling five to eight month eastbound transpacific voyage, no stopping places were available. On the westward voyage, however, the Marianas played an important role in supplying fresh provisions. The loss of a galleon dealt a severe blow to the livelihood of trade participants, particularly those residing in Manila.

The focus of this unique Collection is the assemblage of over 1,300 pieces of 22.5 karat gold jewelry, including a variety of chains, rings, buttons, plate and other decorative gold items set with diamonds, rubies, sapphires and emeralds. The historic and stylistic significance has been extensively documented by Dr. Beatriz Chadour, an expert on historical jewelry. Offering a time capsule of Renaissance jewelry, these beautifully crafted pieces represent a cross section not available in international collections due to the common practice in the 16th and 17th centuries of melting down gold jewelry for casting into more fashionable pieces or for use as currency.

In addition to the precious artifacts, the Collection contains over 150 rare storage jars recovered intact from up to 250 feet of water. These jars, originating from China, Vietnam and Thailand, are inscribed with Spanish, Chinese and Tagalog markings, indicating their original contents and owners. Of vital importance to the galleon crew and passengers during their arduous journeys, these jars contained water and other provisions such as wine, salt, vinegar, wheat, flour and aromatic resins. The Collection also includes wooden jar lids, a twelve foot anchor, lead and iron shot, sounding weights, magnificently preserved decorative furniture fittings, and items providing important clues on the armaments carried, ballast material, porcelain cargo, and other aspects of the Manila galleon trade and shipboard life.

The recovered artifacts are complemented by a four foot long fully-rigged model of the *Concepción*. Mounted charts depict the galleon passages and the major current and wind patterns that defined the trade routes. Three twenty-minute video films highlight the project and personalities involved: one film, hosted by actor Philip Michael Thomas, appeared on U.S. television during the 1990 fall season. A comprehensive slide presentation was also prepared for display and educational purposes.

Three impressive paintings by Roger Morris, a well-known New Zealand maritime painter, show the *Concepción* getting underway in Manila Bay, sailing in a stiff wind, and breaking up on the treacherous reefs of Saipan. Mr. Morris has also prepared a detailed and colorful cross-section of the *Concepción* for use by *National Geographic*, illustrating the vessel's interior during the process of loading cargo at the royal dockyards in Cavite, near Manila. Two additional paintings by Marilee Krinitt, an artist from Guam and one of the project's deep divers, portray a cross section of Agingan Bay showing recovery operations, and a contemporary Chamorro woman recovering a gold chain and a storage jar.

A series of color photographs by Pacific Sea Resources' professional cameramen document the process of survey, recovery, conservation and restoration of the jewelry and artifacts. These photographs highlight the personalities involved in the project, the various roles that were necessary in the successful recovery of the galleon's artifacts, and the beautiful marine life in the Marianas.

The announcement of the results of the *Concepción* project occurred in *National Geographic* in the September 1990 issue. The cover story on the Manila Galleon trade and the *Concepción*, 52 pages in length, is one of the longest article to appear in *National Geographic*. Eleven million copies of each issue are distributed with a worldwide readership conservatively estimated at over forty million. Several other major publications, including Christie's International Magazine with a circulation of 60,000 collectors worldwide, have also printed professional and popular articles about historic, technological and diving aspects of the project. A 180 page full color photo-documentary book about the *Concepción* project set in the context of the Manila Galleon trade and the beautiful Mariana Islands has also been published. It provides a vivid account of the routine and dangers of the galleon voyages, as well as the romance and excitement of the archaeological recovery operations.

The Collection includes a comprehensive Archaeological Report with extensive information on the historical background of the galleon trade, the recovery methodology, the significance of the gold jewelry and the ceramic cargo from the *Concepción*. The report highlights the dedication and thoroughness of the thirty professionals from seven countries during their ten month onsite recovery operation. State of the art equipment, computers and methods were used throughout the project, including careful environmental monitoring of Agingan Bay.

Organized to stand as a comprehensive exhibit, the Collection will be an important promotional exhibit for the Mariana Islands. In addition, other materials will be available for purchase by visitors to the exhibition. Project videos and slides of the Collection artwork and Mariana Islands will be for sale, along with colorful portrayals of island lore, postcards and posters. Replicas of the most significant jewelry pieces are to be sold in the Exhibition's shop.

The *Nuestra Señora de la Concepción* Collection is romantic, tragic, inspiring and most importantly unique. Containing items not available in any other collection in the world, this Collection's physical artifacts, academic research and popular materials are vital to enhancing the world's knowledge of this important aspect of maritime trade history.

INVENTORY OF CONCEPCION COLLECTION

Category	Quantity
I. Gold Jewelry	
Buttons: Types AA, A-J (11 varieties)	1014
Cup-shaped: Setting only	7
With crystal	5
Helmet-shaped setting	9
Flat-back types (9 varieties)	44
Flat-back with pearl setting	4
Flat-back with diamond (types 1-3)	17
Flat-back with emerald	2
Flat-back without emerald	1
Pyramid-shaped setting	10
Chains: 32 simple chains with wire tie	1
Simple with small, long links (6 varieties)	13
Simple fragments	7
Complex of various types, filigree, some with settings (21 varieties)	14
Complex fragments	31
Beads: Spacer types A-F, H-K (11 varieties)	102
Crosses: Filigree	1
Diamond (9)	1
Belt ends: Complete	5
Back only	1
Brooch/Belt end with diamonds (13)	1
Clothing ornament with diamonds (11)	1
Clothing decoration (two piece)	2
Shoe with diamonds (41)	1
Comb dated 1618	1
Hair pin with cross	1
Tube with diamond cap	1
Baskets: Filigree lower section	1
Filigree top	1
Handle (ewer)	1
Filigree items	7
Higa pieces	4
Granulated wire links	5
Lid with inscription	1
Plate sections	18
Emperor's Plate sections	4
Pendent domed	1
Oval Santiago cross	1
Sleeve with insert	1
Rings: Diamond Studded	5
Ruby	2
Amethyst	1
Sapphire	1
Other	8

Category	Quantity
Gems: Amber	1
Amethyst	1
Flat wire work with wire & spacer beads	42
Flat wire (incomplete)	4
Ornamental openwork (sections)	20
Unidentified gold ornaments	84

II. Other Artifacts

Ship's structure	
Bolts	Casts
Spikes	Casts
Tacks	Casts
Lead sheathing sections	Numerous
Ship's Gear	
Twelve foot anchor	1
Scalloped door ornament	1
Lead sounding weights	11
Ballast stones	Numerous
Ordnance	
Cannon balls	50
Musket and arquebus shot	400
Lead cube shot	10
Cannon dolphins	6
Cannon cascabels	2
Specie	
Spanish coin (1 Real)	1
Chinese coins	15
Chinese coin stacks	2
Personal Effects	
Brass Buttons	4
Cloak clasp	1
Sword chape	1
Sword clasp	2
Sword pommels	3
Domestic Items	
Spoon handle fragments	2
Knife handle fragment	1
Chinese weight	2
Lace making bobbins	8
Silver bowl/cup handles	3
Candle stick pieces	3
Pestles	3
Keys (1 Chinese)	8
Chinese lock	1
Pin	1

Category			Quantity
Cargo			
	Storage jars		156
	Wooden lids		11
	Peppercorns		Numerous
	Glass beads		27
	Furniture fittings:	Scalloped buttons	23
		Fleur-de-lys buttons	61
	Furniture tacks:	Domed	4
		Tiered domed	129
		Star-shaped	97
	Jar Contents		
		Bones	Several
		Resin, Aromatic	2
		Pebbles	Several
	Shards		
		Porcelain	Numerous
		Stoneware	Numerous
		Earthenware	Numerous
	Unidentified Objects		
		Silver	4
		Copper Alloy	29

APPENDIX B

STRUCTURE OF ARTIFACT DATA BASE

(FIELD NAME - description; if applicable, menu options are below field name)

ARCHO_NOT - indicates if memo file

ARTIFACT - unique ID for artifact

ATTRIBUTE - a major characteristic
- ABBR - abrasions
- BASE - base
- BODY - body
- BURN - burnt or charred
- CARI - carination
- CHOP - chop
- CLEA - clear/transparent
- CONC - concreted
  - ANCH - anchor
  - COIN - coinage
    - CHIN - Chinese origin
    - MEXI - Mexican origin
    - SPAN - Spanish origin
  - GUNN - gun or armament
    - CASC - cascabel
    - DOLP - lifting dolphin part gun
  - UNSP - unspecified other item
- CORR - corrosion
- DECO - decorated
- ENCR - encrustation
- FILL - filigree work
- GLAZ - glaze
- INIT - initials/owner mark
- INSC - inscription
- REIG - reign mark
- RIMM - rimmed
- WORK - worked/finished object

COLR_OTHR - Y/N for if > 2 colors

COLR_PRIM - primary color of object
- BLAC - black
- BLGR - blue green
- BLUE - blue
  - DRBL - dark blue
  - LIBL - light blue
- BROW - brown
- GOLD - gold
- GRAY - gray
- GREE - green
- ORAN - orange
- PINK - pink
- REDD - red
- TEAL - teal gray
- TURQ - turquoise

VIOL - violet or indigo
WHIT - white or cream
YELL - yellow

COLR_SECO - see COLR_PRIM for options

COMMENTS1 - relevant comments

COMMENTS2 - more relevant comments

COMPLETE - rating (0-9)

CONSERVED - Y/N for if conserved yet

CONTEXT - attribute of the site

DECORATIO - ornamentation description

DIM_A - largest dimension (see S_UNITS)

DIM_B - second largest dimension

DIM_C - smallest dimension

FEATURE - characteristic of site
CREV - crevice
LEDG - ledge
DEPR - depression
BEDR - bedrock
RUBB - rubble

GRID_X - refers to map coordinate

GRID_Y - refers to map coordinate

GRID_Z - refers to map coordinate

LINK_TO - artifact number of related object

NAM_FORMA - formal name
BULL - bullion or specie
BARS - bar or ingot
CHIN - Chinese origin
GOLD - gold
MEXI - Mexican origin
SILV - silver bars
SPAN - Spanish origin
COIN - coin or coins
CHIN - Chinese origin
MEXI - Mexican origin
SPAN - Spanish origin
NUGG - nugget
CHIN - Chinese origin
SPAN - Spanish origin

SILV - silver
STRL - sterling
UNSP - unspecified other item
CONC - concretion
ANCH - anchor
COIN - coinage
CHIN - Chinese origin
MEXI - Mexican origin
SPAN - Spanish origin
GUNN - gun or armament
CASC - cascabel
DOLP - lifting dolphin part gun
UNSP - unspecified other item
DOME - domestic item
BOTT - bottle
CONT - container
BEAK - beaker
BOTT - bottle
BOWL - bowl
FISH - fishing item
FLOA - fishing float
HAND - handline
SQUA - fisherman's square
PERS - personal item
RECR - recreational item
UNSP - unspecified other item
UTEN - utensil
FITT - ship's fitting
ANCH - anchor
BALL - ballast stone
BLOC - block
GALL - galley fitting
RIGG - rigging
ROPE - rope or cable
STER - steering gear
UNSP - unspecified other item
JEWL - cargo jewelry/gems
BEAD - bead/spacer bead
BEAA - type A spacer bead
BEAB - type B spacer bead
BEAC - type C spacer bead
BAED - type D spacer bead
BEAE - type E spacer bead
BEAF - type F spacer bead
BEAG - type G spacer bead
BEAI - type I spacer bead
BEFP - large 4-paneled bead
BEHW - hollow bead with small sphere
BETS - hollow bead with small spheres
BUTT - button
BUTA - button type A
BUTB - button type B
BUTC - button type C
BUTD - button type D
BUTE - button type E
BUTF - button type F

BUTG - button type G
FLAT - flat button
FLOW - flower button
PYRA - pyramidal button
SQUR - square button
CHAI - chain
CHAA - simple chain, small link
CHAB - simple chain, large link
CHAC - simple chain, medium link
CHAD - simple chain, tiny link
CHAE - simple chain, long link
COMA - complex chain, type A
COMB - complex chain, type B
COMC - complex chain, type C
COMD - complex chain, type D
GEMS - gemstone cut/uncut
DIAM - diamond
ORNA - ornamental object
OTHR - other jewelry items
BUTB - gold button B
BUTT - gold button A
CDEC - clothing decoration
FILI - tubular filigree item
GTOP - gold top or cap
STRI - gold strip of metal
RING - ring
SIGN - signet ring
UNSP - unspecified other item
WIRE - wire or braid
MODE - modern item
NAVI - navigational item
ASTR - astronomical instrument
COMP - compass
SOUN - sounding gear
TIME - timepiece
UNSP - unspecified other item
ORDN - ordnance or weaponry
CARR - gun carriage
CHAR - chariage gun
FURN - furniture gun
GUNN - Gun/part of a gun
CASC - cascabel
DOLP - lifting dolphin part gun
HAND - hand weapon
MUSK - musket shot
PROT - protective
SHOT - other shot, round/ball
ARQU - arquebus shot
CHAM - chamoro throw stone
IRON - iron shot/cannon ball
LEAD - lead musket/arkabus shot
MUSK - musket shot
UNSP - unspecified other shot
PORC - porcelain

SKEL - skeletal remains
ANIM - animal remains
BUFF - water buffalo
OXEN - oxen
PIGS - pig or hog
FISH - fish remains
FLOA - fishing float
HAND - handline
SQUA - fisherman's square
HUMA - human remains
STOW - stowage/storage container
BARR - barrel
BASK - basket
CHES - chest or trunk
STJR - storage/olive jar
STRU - ship structural item
BOLT - bolt/spike/nail
KEEL - keel bolt
SPIK - spike or nail
EXTR - external item structure
INTR - internal item structure
MAST - mast
UNSP - unspecified other item
TABL - tableware; porcelain & other
BOTT - bottle
BOWL - bowl
CONT - container
BEAK - beaker
BOTT - bottle
BOWL - bowl
CUPP - cup
DISH - dish
EWER - ewer
JARR - jar
JUGG - jug
PLAT - plate
POTT - pot
UNSP - unspecified other item
UTEN - utensil
VASE - vase
TEXT - textile/clothing
BELT - belt
FINI - finished clothing
FOOT - boot/footwear
RAWW - raw cloth
UNSP - unspecified other items
TOOL - tools & equipment
CARP - carpentry
MEAS - measure or ruler
SAIL - sailmaking
UNSP - unspecified other item

NAM_SIMPL - subfield of NAM_FORMA

NAM_SPECI - sub-subfield of NAM_FORMA

PARTS - how many pieces there are

PART_OF - artifact number it is part of

PHOTOGRPH - Y/N for if 35mm print exists

P_MAT_CLS - primary material class
- CERA - ceramic
  - EART - earthenware
    - GRRD - grey red earthenware
    - TERA - terra-cotta
  - PORC - porcelain
  - STON - stoneware
    - CGRY - coarse greyware
    - GCEL - glazed celadon
    - UNSP - unspecified other item
  - UNSP - unspecified other item
- GLAS - glass
- META - metal
  - BRON - bronze, brass, copper
  - GOLD - gold
  - IRON - iron
  - LEAD - lead
  - PEWT - pewter
  - SILV - silver
    - STRL - sterling
  - UNSP - unspecified other item
- ORGA - organic
  - BONE - bone
  - CAUL - caulking
  - CORD - cordage
  - LEAT - leather
  - SHEL - shell
  - UNSP - unspecified other item
  - WOOD - wood
- STNE - stone/gemstones
  - COMM - common type stone
  - GEMS - gemstone
    - DIAM - diamond
- TEXT - textile
  - BELT - belt
  - FINI - finished clothing
  - FOOT - boot/footwear
  - RAWW - raw cloth
  - UNSP - unspecified other item

P_MAT_SUB - subclass of PRIM_MAT

P_MAT_TYP - sub-subclass of PRIM_MAT

RADIOGRAPH - Y/N for if x-ray exists

RECOV_DAT - date object recovered

SAMPLES - Y/N for if samples taken

SHAPE - shape of object
- BARR - barrel
- BASE - base/supporting section
- BODY - body section of artifact
- BROK - broken edged section
- CARI - carination or ridge
- CYLI - cylindrical
- FRAG - fragment
- HAND - handle
- HOOK - hooked end
- LINK - linked chain
- NECK - neck or shoulder
- PLAT - platter
- RIMM - rimmed
- ROUN - round/rounded
- SQRE - square
- TUBE - tubular

STATE - condition of object (0-9)

STORD_IMA - Y/N for if image exists

SURVEY - temp # correl. to uw image

S_MAT_CLS - secondary material class

S_MAT_SUB - subclass of S_MAT_CLS

S_MAT_TYP - sub-subclass of S_MAT_CLS

S_UNITS - size: exp. base 10 (0 is mm)

VALUE - rating of worth (1-9)

W_UNITS - exp. base 10 (0-gm, 3-kg)

ZONE - location of find
- GUL1 - gully 1
- TRA1 - transect 1
- GUL2 - gully 2
- GU2A - gully 2a
- GUL3 - gully 3
- CAN1 - canyon 1

APPENDIX C

RESIN REPORT

Archeological Resins
from Shipwrecks Off the Coasts of
Saipan and Thailand
(DRAFT)

by
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Introduction:

This report presents analyses of resinous substances from shipwreck sites excavated in waters off Thailand and Saipan. Fourier transform infrared spectrometry, gas chromatography, and gas chromatography-mass spectrometry were all applied to the problem of identifying resins from three wrecks in the Gulf of Thailand and a Manila galleon off Saipan Island in the Marianas Island chain for the purpose of reconstructing past technological and trade patterns.

Two samples of resin from an excavation of the Nuestra Senora de la Concepcion shipwreck were received from Michael Flecker of Pacific Sea Resources Ltd. for analysis and identification. The Nuestra Senora de la Concepcion, a Manila galleon, was wrecked in 1638 on its way to Acapulco. Among the many finds from the site were 150 intact storage jars (approx. 45-50 cm in height), two of which still retained their contents of resin. (The other storage jars were probably for fresh water and other provisions.) Sample 1 (4.58 g) was desalinated in fresh water for 3 months; sample 2 (19.40 g) was desalinated for one month.

The samples from Thailand were derived from three different shipwrecks lying off the eastern coast of the Bight of Bangkok: Pattaya, Ko Si Chang One and Ki Si Chang Three (see Figure 1). The Pattaya ship (Green and Harper 1983) had been extensively looted prior to the excavation but the hull was studied in detail. This sample (599B, Pat 1987) from that ship is probably the remains of caulking between the timbers. Ko Si Chang One (Green et al. 1986), dated to the mid 16th century, was very well preserved, yielding Chinese porcelains, ceramics and lacquerware, Thai ceramics, firearms and resin. Resins were found as sealants to attach the lids on large storage jars found among the cargo (Burns pers. comm.). Ko Si Chang Three (Green et al. 1988) was a small trading vessel with various products on board, including resin (sample 86-29) and eggs. The site was radiocarbon dated to 1410 + 70.

Instrumentation and Methods of Procedure:

Infrared spectrometry has been shown to be an important technique for the identification of resinous substances. Resins are complex mixtures of compounds, making the absorption spectrum much more difficult to interpret. However, spectra from these mixtures can often provide a fingerprint of that botanical type (Langenheim and Beck 1965). A Matson Cygnus 100 Fourier transform infrared spectrometer (FTIR) was used. A computer attached to the spectrometer is able to co-add digitized scans in order to increase sensitivity and reduce random noise in the averaged spectrum. We analyzed the samples with the Spectratech IR-Plan microscope attachment to the spectrometer. This required a very small sample placed on a diamond cell in the infrared beam. Most of the reference samples had been analyzed previously using KBr pellets in the spectrometer itself.

A Hewlett-Packard 5830 gas chromatograph with a DB-1 column was used to supplement the data we acquired from the FTIR. A Carlo Erba gas chromatograph attached to a Finnigan MAT mass spectrometer was used to provide additional information about constituent compounds. Samples for both of these were dissolved in methylene chloride and then methylated with dimethylformamide dimethyl acetal.

Analysis and Discussion:

The infrared spectra were compared to each other and to the spectra in our reference library (Gianno et al. 1987). Figure 2 presents the infrared spectra from the five archeological samples plus a spectrum from a reference sample of Styrax bensoin Dryander resin and three other local resin types. The resin samples were collected with a botanical voucher specimen by Gianno in Malaysia and identified by K. M. Kochummen. Three of the five archeological samples had spectra strikingly similar to that of Styrax bensoin Dryander. The spectra from Ko Si Chang One and Pattaya are clearly different; they broadly resemble triterpenoid resins in our reference collection but are generally more muted and do not match any one reference spectrum in detail. Since there are over a thousand species of resin-producing plant species in Southeast Asia, this is not unexpected.

Styrax benzoin

In Figure 2a-d the very broad band on the left is indicative of O-H bonds, associated variously with alcohols, moisture, and polysaccharides. The sharper peak at 2938 cm represents the alkane groups of CH2 and CH3, which normally form the skeleton of resin molecules. Both of these peaks are obscured in Figure 2b because of scattering of light, possibly from water in the sample. Fortunately this did not affect the right side of the spectrum, which is more critical. The inverted peak in 2a (Saipan 1) at about 2300 is an artifact due to carbon dioxide in the air around the sample. A background spectrum (without any sample in the beam) must be obtained in order to subtract atmospheric effects on the spectrum, but sometimes because of momentary local changes in the atmosphere there is overcompensation.

The peak at 1710 is in the carbonyl (C=O) range but it is not possible to identify it securely as an acid, ketone, aldehyde or ester. The sharp peaks at 1602, 1514, 1451 and 714 are probably indicative of an aromatic (benzoic) ring (Colthup 1980:82-85). These are all reflective of the various constituents of benzoin resin which is a flavonoid with some terpenoid compounds.

Therefore, the three shipwreck sample spectra are very similar to that of Styrax benzoin, a species of tree that occurs in Sumatra, Malaya and western Java, but was cultivated only in Sumatra (Burkill 1966:2139). The specimen whose spectrum is illustrated here is from Tasek Bera, Pahang, Malaysia. Styrax benzoides Craib. of northwestern Thailand and S. tonkinense Craib., which occur in Thailand and Indochina, are similar to S. benzoin. There are also several species of Styrax that occur in Bolivia and S. officinale (called "storax") is found in Syria and Asia Minor as well as western North America (Burkill 1966:2139-45). Regarding storax, Burkill (p. 2145) notes, "The resin was used in early times, but in the sixth century that of Liquidambar orientalis began to push it out of its Levantine markets." Infrared spectra of storax included in the Sadtler library are actually from L. orientalis. We do not have samples of other Styrax species, and do not know whether these would yield spectra distinguishable from that of S. benzoin. We suspect those in the New World and the Near East would be different.

Burkill (1935), probably relying on Reinitzer (1921, 1925, 1926), and an old source for this kind of information states, "Benzoin consists principally of two alcohols combined with cinnamic acid and associated with free benzoic acid, or free cinnamic acid. One of the two alcohols, benzo-resinol, occurs alike in Sumatran and in Siamese benzoin; but the two kinds of benzoin differ in regard to the other, Sumatran containing free cinnamic acid and Siamese free benzoic acid" (1966:2139). This indicates that there is the likelihood that the two can be distinguished.

Schroeder (1968) more recently used paper chromatography to analyze resin that he describes as

Siam benzoin gum even though the species name listed is Styrax benzoin Dryander. This was probably the trade name under which the sample was marketed. He found the major constituent to be coniferyl benzoate (75-80 per cent). Benzoic acid constituted about 12 per cent.

Mills and White (1987:95), in discussing balsamic resins (of which benzoin resin is one example) state, "the main components are not terpenoid but esters of benzenoid acids (benzoic and cinnamic acids) with benzenoid alcohols." In regard to Styrax in Sumatra and Thailand, they write, "Little work has been done on their chemistry in recent years; as well as triterpenes they contain large amounts of coniferyl benzoate" (ibid.).

Since, according to Burkill, Sumatran benzoin could be distinguished from Siamese benzoin based upon the presence of either benzoic acid (for Siamese) and cinnamic acid (for Sumatran), we proceeded to inject the samples into the gas chromatograph. We also ran cinnamic acid and benzoic acid reference samples for comparison. The chromatogram for benzoic acid contained peaks that occurred in the Styrax benzoin chromatogram. We then proceeded to run the sample through the GC-MS. The latter analysis showed that the peaks were methyl benzoate, a product of the methylation of the free benzoic acid in the resin. We did not find any concentrations of cinnamic acid. This contradicts Burkill's statement that Sumatran benzoin (Styrax benzoin) is characterized by cinnamic acid while Siamese benzoin (S. tonkinense and S. benzoides) contain benzoic acid. Therefore, it is not possible at present to state that these resins are from a particular Styrax species, only that they very closely resemble Styrax benzoin resin.

Triterpenoid Archaeological Resins

Figure 2e-f, the resins from Pattaya and Ko Si Chang One, are both terpenoid resins and, therefore, do not necessarily have aromatic benzenoic rings. Figures 2g-h are reference samples from Peninsular Malaysia that are important economically. The Large absorbance peaks on the left side of the spectrum are similar to those in Figure 2a-d. The peaks around 1700 are in the carbonyl range. The peaks at approximately 1453 and 1376 are the result of absorption by CH2 and CH3 bonds, respectively. The area of the spectrum between 500 and 1300 cm is called the fingerprint range because here the positions of absorption bands depend minutely upon the molecular environment of the absorbing moieties. Thus, this is where families and genera of plants can often be distinguished. (Langenheim and Beck 1965).

Gas chromatography showed that the two archaeological resins mainly consist of sesquiterpenoids and triterpenoids indicating that they probably derive from either the Dipterocarpaceae or Burseraceae families; b-amyrin and similar triterpenoids were found. However, these occur in many different plant species in addition to the two families named above. The Pattaya sample is most similar to our chromatogram from Dipterocarpus costulatus, which would be appropriate, but we have not yet found a very strong match with a reference sample.

The genera illustrated in Figure 2g-h occur over a large area of Southeast Asia. Various species of the genus Dipterocarpus like Dipterocarpus grandiflorus and D. costulatus have long been used in Southeast Asia for boatcaulk. Hopea spp. trees, like Hopea dryobalanoides (Dipt.), usually produce clear, colorless resins which are preferred ingredients for varnishes and can also be used for caulking wooden hulls. Triomma malaccensis (Burs.) is less well known and widespread, probably confined to Sumatra and Malaya, but at least among the Orang Asli (Malaysian aborigines); it is important ritually as incense.

Cultural Background:

Archaeologically, Styrax resin has yet to be identified in a land site in Southeast Asia. Its occurrence in this underwater site indicates that it could survive on land as well.

Styrax benzoin Dryander is called kemenyan in Malay. The names for Styrax in Thailand/Indochina are related to the Malay name and are believed derived from it (Wheatley 1959). It is commercially available in herbal shops in Malaysia and Indochina, albeit adulterated. Different local cultures attribute

various powers to it. In general it is believed to be either an offering or a way of signaling or calling certain spirits to the aid of a supplicant or healer. It is very important in Malay culture for rice reaping and planting rituals in which the supplicant is trying to coax the rice spirit to stay and allow an abundant harvest. The cinnamon-like aroma is usually considered to be pleasing to benevolent ancestral or forest spirits. The tree is cultivated in Barus and Tapanuli in northwestern Sumatra and Palembang in South Sumatra (Pelzer 1978:278-9) mainly for trade. In Malaya, there was very little tapping done for the market. Since the trees are dispersed, whatever is collected is usually just used by the tapper or the local community. It is not certain when cultivation first began, although Marsden (1811) observed it in the eighteenth century.

For Europe, Burkill (p.2142) writes, "Benzoin is used in European medicine as a stimulating expectorant in the form of a tincture, for acute coryza and in the early stages of inflammation of the pharynx when the throat feels harsh and dry, or it is used in steam for acute laryngitis." It is also an ingredient in skin balms and poultices and is used as a plasticizing agent in varnishes.

Early sources are difficult to interpret and the philological identifications are necessarily controversial (Wheatley 1959, Wolters 1967). However, it appears that the Arabs and Europeans regarded it more highly than frankincense. They called it luban jawi (frankincense of Java). Burkill (p.2140) writes, "It is of interest to note that they obtained it in Java, where the tree, though present, is too rare and local to be a source of benzoin...". In addition to its superior fragrance, it was sought after for its medicinal properties. Ibn Battuta mentions it as a product of Sumatra in the fourteenth century (Pelzer 1978:278).

Styrax benzoids was traded north to China from at least the 13th century and was exported from Bangkok and Hanoi earlier in this century (Burkill 1935). Wheatley (1959:55-59) mentions that benzoin was being traded north to China by the 8th or 9th centuries A.D.. "In 1498 benzoin was among the presents given by the Zamorin of Calicut to Vasco da Gama, and in 1501, it made part of the valuable cargo which Cabral brought back to Portugal from India" (Burkill 1935:2141). He goes on to say that S. benzoides was extracted by jungle dwellers in the rainy season, suggesting that it was not cultivated.

These species do not occur in the Philippines or eastern Indonesia, indicating that the contents of the jars on the Nuestra Senora must have been transshipped either from Mainland Southeast Asia or Sumatra. It is possible that these resins were also being carried for rites to be performed in transit, but their presence must have been mainly for trade in Mexico or intended for further transshipment to Europe.

Conclusion:

Five archaeological resins from four sites in Southeast Asia and Micronesia were chemically analyzed for identification. Three resin samples from a local Southeast Asian ship and a Manila galleon shipwreck site have been identified as derived from a Styrax sp. tree, probably Styrax benzoin. Two of the samples are triterpenoid resins, possibly from dipterocarp trees.

Based on historical accounts and the ethnographic record, benzoin has been considered an important incense resin since ancient times. On both the Saipan wreck (two large storage jars) and Ko Si Chang Three the resins appear to have been intended for trade. This analysis establishes that benzoin can survive in aqueous archaeological contexts for considerable spans of time without significant deterioration.

Acknowledgements:

We would like to thank Peter L. Burns for providing the samples from Thailand. Michael Flecker, conservator on the Nuestra Senora project, sent us the samples from that site and William Mathers and Henry Parker provided much background information. The information included here is intended strictly for scientific purposes. Rosemary Gianno was supported in this research by a Material Science Postdoctoral Fellowship from the Smithsonian Institution.

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APPENDIX D

PRINCIPAL MARINE ORGANISMS SIGHTED AT SURVEY/RECOVERY SITE, AGINGAN BEACH, SAIPAN, CNMI, 1987-1988

(* Specimen, photograph or video record)

Phylum Porifera
- Unidentified species

Phylum Cnidaria
- Class Hydrozoa
  - Order Hydroidea : Hydroids
    - Unid. sp.
  - Order Milleporina : Fire corals
    - Millepora latifolia*
    - Millepora platyphylla
- Class Scyphozoa
  - Order Semaeostomae
    - Unid. medusa
- Class Anthozoa
  - Subclass Octocorallia
  - Order Gorgonacea : Gorgonians and sea fans
    - Gorgonia sp.
    - Sinularia abrupta*
  - Order Actinaria : Sea anemones
    - Heteractis sp.
    - Unid. sp.*
  - Subclass Hexacorallia
  - Order Scleractinia : Stony corals
    - Acropora sp.
    - Astreopora gracilis
    - Astreopora ocellata*
    - Astreopora randalli
    - Astreopora sp.
    - Cyphastrea chalcidicum*
    - Cyphastrea microphthalma*
    - Cyphastrea serailia
    - Cyphastrea sp.
    - Favia pallida*
    - Fungia sp.*
    - Goniastrea retiformis*
    - Goniastrea sp.
    - Goniopora sp.
    - Leptastrea purpurea*
    - Leptastrea sp.
    - Lepturia phrygia
    - Millepora dichotoma
    - Millepora latifolia
    - Millepora platyphylla
    - Montipora sp.*
    - Pavona sp.
    - Pocillopora eydouxi

Pocillopora setchelli*
Pocillopora sp.
Porites lutea*
Porites stephensoni*
Porites sp.*
Stylaster gracilis
Stylophora mordax*
Unid. sp.*

Phylum Ectoprocta : Bryozoans
Unid. sp.

Phylum Platyhelminthes : Flatworms
Pseudoceros sp.

Phylum Annelida
Class Polychaeta
Subclass Sedentaria
Sabellastarte sp. : Feather-duster worm
Unid. sp.
Spirobranchus giganteus : Christmas tree worm
Lanice conchilega : Spaghetti worm

Phylum Mollusca
Class Amphineura (chitons)
Unid. sp.
Class Gastropoda
Lamdis chiragra*
Cypraea moneta
Cypraea tigris
Cypraea caputserpentis
Murex sp.
Conus sp.
Conus textile
Nudibranchs : Phyllidia varicosa
Class Pelecypoda (Bivalves)
Tridacna maxima*
Pecten sp.
Class Cephalapoda
Octopus sp.
Squid

Phylum Echinodermata
Class Crinoidea : Crinoids
Nemaster sp.*
Class Ophiuroidea (Brittle Stars)
Ophiocoma pica
Cushion Stars
Calcita novaeguineae*
Class Asteroidea : Sea Stars
Linckia sp.*
Acanthaster planci (Crown-of-Thorns)
Class Echinoidea
Echinothrix diadema
Echinothrix calamaris
Echinometra mathaei

Echinometra oblonga
Tripneustes gratilla
Class Holothuroidea : Sea Cucumbers
Holothuria atra*
Actinopyga mauritiana*
Unid. sp. (2)*

Phylum Arthropoda
Stenopus hispidus : Red-banded coral shrimp
Snapping shrimp
Panulirus marginatus : Spiny lobster
Lobster species : Unid
Hermit crab species : Unid.
Rock crab species : Unid.
Swimming crab species : Unid.
Carpilius sp. : Coral crab

Phylum Chordata
Sea Squirt : Unid. sp.
Colonial tunicate : Unid. sp.
Class Chondrichthyes : Cartilaginous fish
Triaenodon obesus : Reef Whitetip Shark
Carcharihinus melanopterus : Reef Blacktip
Aetobatis narinari : Spotted Eagle Ray
Dasyatus kuhlii : Blue Spotted Stingray
Manta Alfredi : Manta Ray
Class Oesteichthyes : Bony fish
Echidna nebulosa : Snowflake Moray
Lycodontis javanicus : Leopard Moray*
Lycodontis meleagris : Polkadot Moray
Platybelone platyura : Keeled Needlefish
Adioryx caudimaculatus : White-blotch Squirrelfish*
Adioryx spinifer : Long-jawed Squirrelfish
Aulostomus chinensis : Trumpetfish
Pterois volitans : Lionfish*
Pterois antennata : Spotfin Lionfish
Synanceia verrucosa : Stonefish
Cephalopholis argus : Blue-spotted Grouper*
Cephalopholis urodelis : Flag-tailed Grouper*
Epinephelus fasciatus : Banded Grouper
Cheilodipterus quinquelineatus : Five-lined Percelle*
Carangoides orthogrammus : Yellow-spotted Trevally
Caranx melampygus : Bluefin Trevally*
Mulloidichthys vanicolensis : Yellow-finned Goatfish*
Parupeneus barberinus : Dash-and-dot Goatfish*
Parupeneus bifasciatus : Two-barred Goatfish*
Parupeneus chryserydros : Yellow-saddled Goatfish*
Parupeneus trifasciatus : Three-barred Goatfish*
Parupeneus cyclostomus : Blue Goatfish*
Upeneus arge : Band-tailed Goatfish*
Chaetodon bennetti : Bennett's Butterflyfish
Chaetodon ephippium : Saddleback Butterflyfish
Chaetodon ornatissimus : Ornate Butterflyfish
Forcipiger flavissimus : Long-nosed Butterflyfish*
Centropyge flavissimus : Lemonpeel Angelfish*
Centropyge heraldi : Herald's Angelfish

Amphiprion chrysopterus : Orange-finned Anemonefish
Amphiprion clarkii : Clark's Anemonefish
Amphiprion perideraion : Pink Anemonefish
Chromis caerulea : Blue-green Chromis
Dascyllus aruanus : Humbug Dascyllus
Dascyllus reticulatus : Reticulated Dascyllus*
Dascyllus trimaculatus : Three-spot Dascyllus
Pomacentrus pavo : Blue Damsel*
Paracirrhites arcatus : Arc-eyed Hawkfish*
Paracirrhites forsteri : Freckled Hawkfish*
Cirrhitichthys falco : Falcop's Hawkfish
Coris gaimard : Clown Wrasse (Adult and Juvenile)*
Labroides dimidiatus : Cleaner Wrasse*
Gomphosus varius : Bird Wrasse
Halichoeres hortulanus : Checkerboard Wrasse*
Halichoeres trimaculatus : Three-spot Wrasse
Thalassoma quinquevittata : Five-banded Surge Wrasse*
Scarus sordidus : Multicolored Parrotfish
Scarus gibbus : Gibbous Parrotfish
Parapercis clathrata : Latticed Sandperch*
Ctenochaetus striatus : Common Bristle-toothed Tang*
Nasa unicornis : Unicornfish
Paracanthurus hepatus : Blue Hepatus Tang*
Zanclus cornutus : Moorish Idol*
Sphyraena barracuda : Great Barracuda
Bothus mancus : Pacific Peacock Flounder
Balistoides conspicillum : Clown Triggerfish* (Video)
Balistoides viridescens : Spotted Triggerfish
Rhinecanthus aculeatus : Picassofish
Sufflamen chrysopterus : White-edged Triggerfish
Arothron meleagris : White-spotted Puffer*
Arothron nigropunctatis : Racoon Puffer
Diodon hystrix : Spotted Porcupinefish
Saurida gracilis : Graceful Lizardfish
Cypselurus poecilopterus : Flyingfish
Aphareus furcatus : Reef Silvermouth
Pterocaesio tile : Blue-Streaked Fusilier
Gnathodentax aureolineatus : Yellow Spot Emperor
Lethrinus harak : Black Blotch Emperor

Class Reptilia
Hawksbill Turtle
Unid. Sea Snake

Marine Macroalgae
Caulerpa sp.
Dictyosphaeria cavernosa
Dictyota sp.
Enteromorpha sp.
Filamentous brown algae
Filamentous red algae
Halimeda opuntia
Padina sp.
Valonia sp.

APPENDIX E

INSURANCE

Pacific Sea Resources established a comprehensive insurance program to cover all aspects of risk involved in project operations. To do this as effectively as possible, the insurance was placed with a number of different insurers in several countries by PSR's insurance broker in Singapore who coordinated the portfolio.

The insurance program covered four different facets of the operation: vessel, liabilities, personnel and recovered artifacts. The first part of the vessel insurance covered hull and machinery, materials and equipment against all of the usual marine perils. The interest of the various parties involved was noted, including the owners and loss payees. The sum insured by Lloyds of London was $750,000. The second part of the vessel insurance was the Protection and Indemnity policy with a total indemnity of $3,000,000 for any one accident. This insurance was effected to cover various liabilities a ship owner/operator could incur, including collision, pollution, and injuries to crew, passengers and third parties. A certificate was also provided, as required by the U.S. Coast Guard, against the risk of water pollution in U.S.-controlled waters, such as the Northern Mariana Islands. No claims were made as no equipment was damaged or lost during more than twelve months of operations at sea, mostly along dangerous reef areas.

The second area of insurance covered liabilities. Workmen's Compensation and Employer's Liability covered occupational accidents incurred by both divers and others, and was based on the California Scale of Benefits. The liability limit was $250,000 for any one accident; however while this covered divers only, "over the side," they were otherwise covered under the Protection and Indemnity mentioned above. Additionally, a second layer of insurance was arranged through Lloyds to provide Excess Employer's Liability and Maritime Liability insurance. This covered the same liabilities as above, increasing the limit of liability to a total of $3,000,000 for any one accident. And finally, a comprehensive general liability insurance was arranged to cover liabilities arising from accidents causing injury to third parties or damage to their property. The liability limit was $1,000,000 for any one accident. No accidents occurred resulting in any claims, even though more than 10,200 dives, in depths up to 75 meters, were made during the course of the project.

The third area of insurance was for personnel. Group Personnel Accident insurance covered varying benefits to all personnel (including divers), for accidents whether arising out of employment or not. The benefits included death, permanent disablement and temporary total disablement. The maximum sum insured for any one person was $150,000. Also, a Group Hospitalization insurance covered all personnel against hospital expenses, surgeons, specialists and physicians' fees, and miscellaneous charges associated with illness or accident necessitating hospitalization. The usual scales of benefits as required by California law applied. Only one minor claim was made for an infection resulting from a coral cut to a diver.

The fourth and final area of coverage was the insurance of the recovered artifacts. Insurance for all risks stemming from Transit and Storage was arranged to cover the artifacts while in transit, in storage, and on the premises of the jewelers carrying out the restoration work. Various limits of indemnity applied depending on the location of the artifacts. No claims were made during the process of final conservation, restoration and storage prior to transfer of the artifacts to the final owner of the *Concepción* Collection.

APPENDIX F

ARCHAEOLOGICAL RECOVERY CONTRACT

In 1986 the *Nuestra Señora de la Concepción* and the *Santa Margarita*, two Spanish galleons lost in the Northern Mariana Islands in 1638 and 1601 respectively, were selected from Pacific Sea Resources' list of known losses of vessels that had participated in the Manila Galleon trade for potential archaeological recovery operations. A study of the applicable international, United States and Commonwealth of the Northern Mariana (CNMI) maritime laws and regulations was initiated. After determining that the CNMI owned the title to these abandoned shipwrecks, a review was undertaken of marine archaeological recovery contracts entered into by various states such as Florida, Massachusetts, North Carolina and Texas. Using the terms of these agreements as a guide, a clear and equitable proposed contract was developed for submission to the CNMI.

Once the concept of this recovery project was accepted by the CNMI, as outlined in PSR's initial visual and document presentations, the draft contract for the recovery of historic shipwrecks was submitted. The general terms of the contract between PSR, a fully incorporated company in the CNMI, and the Government, defined the rights, intentions, and obligations of both parties. Upon the deposit of a performance bond PSR obtained the exclusive right to survey certain areas within a twelve month period. Based on the survey results, salvage sites were designated for a two year period of recovery operations, with an option for an additional two years.

Terms defining the requirements for a comprehensive insurance program, methods of appraisal, media rights, project confidentiality, arbitration, periodic reporting requirements and the agreed percentage division of artifacts recovered were agreed in accordance with the proposed contract. Complete project financing was the responsibility of PSR. In addition the government was entitled to twenty-five percent of the gross proceeds if the collection was sold, and the Government also maintained the right to select artifacts up to twenty-five percent of the total appraised value. A final option allowed for the collection of artifacts to remain as an entity, either purchased by the Government, or sold to a mutually acceptable buyer.

In order to preserve the data available from these historically significant shipwrecks, PSR incorporated into the contract an Archaeological Data Recovery Program and a detailed Artifact Handling and Processing Plan. This archaeological program was operated in close cooperation with the Historic Preservation Office (HPO) in Saipan and an HPO officer was assigned to monitor the project on a full time basis. Pre-disturbance and monthly status reports, summarizing the daily logs, were submitted while onsite, and the final results of the project were presented in a major Archaeological Report.

In order to comply with the rules and regulation of the CNMI's Office of Coastal Resources Management (CRM), a comprehensive Environmental Monitoring Program was developed in cooperation with CRM. Regular reports detailing the marine environment and the minimal impact of the recovery operations were submitted to CRM and the U.S. Army Corps of Engineers. A CRM officer also worked frequently onsite with PSR's recovery team.

The legal documents concluding the sale of the entire assemblage of artifacts recovered and supporting exhibition materials were prepared by PSR's lawyers in consultation with the Attorney General's Office in the CNMI. In the significant clauses of these agreements, the purchaser, Apex Corporation of Japan, agreed to maintain the collection as an entity, establish a purpose built museum in Saipan to house the artifacts, and donate a representative sampling of original artifacts to the Government. At the signing of the sales agreement the Chairman of Apex, Mr. Hajime Mori, also stated that it was his intention to donate the entire collection to the CNMI within forty years.

APPENDIX G

CONCEPCION PROJECT PERSONNEL

	NAME	AGE	NAT'L
MANAGEMENT			
Project Manager/Diver	Mathers, Bill	44	USA
Asst. Project Mgr/Diver	Parker, Hank	43	USA
Engineering Mgr/Diver	Potter, Derek	39	Brit
Marine Superintendent	Carr, Nutty	57	Brit
Administrator/Diver	Lee, Cecilia	34	S'pore
Onshore Coordinator	Parker, Susan	42	USA
ARCHAEOLOGY/CONSERVATION			
Archaeologist/Diver	Crowdy, Amanda	27	Brit
Archaeologist/Diver	Bernard, Kelly	28	USA
Finds Supervisor/Diver	Malcom, Corey	25	USA
Conservation Supervisor	Clamor, Myrna	43	Phil
Conservator/Diver	McIntosh, David	25	USA
Conservator	Siver, Noel	46	USA
Illustrator/Diver	Bersamira, Eduardo	41	Phil
Survey/Artist/Diver	Krinitt, Marilee	46	USA
COMPUTERS/ELECTRONICS			
Data Systems Supv/Diver	Claxton, William	35	USA
Programmer/Diver	Hall, Martin	27	Brit
Programmer/Diver	Green, Diane	32	USA
DIVING			
Diving Supervisor	Flecker, Mike	25	Aust
Diving Instructor	Spurlock, Bill	38	USA
Diver/Rigging Supv	Nawin, Entu	31	Malay
Diver/Welder	Tutong, Donny	25	Malay
RELATED ACTIVITIES			
Marine Biologist/Diver	Chambers, Michael	25	USA
Video Cameraman/Diver	Johnston, Ned	33	USA
Photographer/Diver	Burkhart, Bill	45	USA
Photographer/Diver	Mathers, Michael	44	USA
Writer/Diver	Toperoff, Sam	54	USA
VESSEL			
Captain/Radio Operator	Ukosachan, Pricha	51	Thai
First Mate/Diver	Ruenrawat, Jumnian	43	Thai
Second Mate/Diver	Laosumrit, Aroon	30	Thai
Engineer/Diver	Jong-on, Wirat	48	Thai
Engineer/Diver	Somsiri, Lee	49	Thai
Cook/Diver	Silpi, Lertrat	31	Thai
Asst. Cook/Diver	Prommi, Vichai	39	Thai
Boat Operator/Diver	Legan, Maja	40	Malay
Boat Operator/Diver	Manja, Melayu	29	Malay

APPENDIX H

CORPORATE PROFILE

Pacific Sea Resources was established by William Mathers in 1985 to undertake the archaeological recovery of historic shipwrecks, concentrating initially on the Spanish galleon, *Nuestra Señora de la Concepción*, which was lost in 1638 off Saipan in the Commonwealth of the Northern Mariana Islands. This five year effort involved the recovery, documentation, conservation, restoration and extensive study of the artifacts remaining from the wreck of the *Concepción*. Paintings, models, and charts were produced to complement the artifacts, known collectively as the *Concepción* Collection. The Collection was sold to a Japanese resort company, which is building a museum to display the Collection in Saipan. A photo-documentary book and a major Archaeological Report, designed to disseminate the knowledge gained from the project to scholars and the public and to promote the Mariana Islands, have also been produced.

In order to expand Pacific Sea Resources' capabilities to include the deep water recovery of historic wreck remains and modern cargoes, Kenneth Caldwell's Omega Marine Group, based in Houston, became a major shareholder in the corporation. Omega Marine is the leader in the development of deep water technology for the marine industry, particularly for offshore oilfield facilities. In addition to design engineering, Omega Marine provides project management and inspection services for offshore oil and gas production facilities, pipelines, deep water mooring systems and other aspects of the petroleum industry.

Operationally Pacific Sea Resources is supported by the IpcoMarine Group, a major marine contractor based in Singapore, established by Mr. Mathers and two partners in 1977. IpcoMarine provides project personnel, equipment and logistics support for ongoing field operations. Brian Chang's Promet Berhad, a group with extensive experience in the fabrication of oil drilling rigs, offshore platforms and oilfield support craft, provides operational support in the form of equipment fabrication, loadout yard facilities and specialized vessels for recovery operations. Promet also has been extensively involved in real estate and tourist development projects in Southeast Asia.

The PSR corporate group is composed of individuals with a wide range of expertise and impressive records in the offshore industry and other commercial enterprises. The corporation is supported financially by investors with backgrounds in the marine industry and venture capitalists within Baring Brothers, a leading merchant bank in England. Pacific Sea Resources believes that the commercial success of the *Concepción* Project has proven the effectiveness of its comprehensive archaeological, technological and contractual approach to the recovery of valuable shipwrecks.