# VENETIAN SHIPS AND SEAFARING UP TO THE NAUTICAL REVOLUTION: A STUDY BASED ON ARTISTIC REPRESENTATIONS OF SHIPS AND BOATS BEFORE CA. 1450

A Thesis

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## ABSTRACT

Venetian Ships and Seafaring up to the Nautical Revolution:
A Study Based on Artistic Representations
of Ships and Boats before ca. 1450. (May 1992)
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Ships and boats were unquestionably vital to the Venetian Maritime Republic, and her ships were of extreme importance historically. Many details as to the nature of these watercraft, however, have yet to be well understood. What types of watercraft did the Republic employ? What are their characteristic features? What sails, rigging, rudders, and anchors were used? What is known of construction techniques? Three forms of evidence exist with which one can begin to answer such questions: archaeological remains of ships or boats, written documents concerning vessels, and artistic representations of watercraft.

Maritime art is an indispensable source of data for the study of nautical archaeology, however, it will never be fully utilized if such material is not completely cataloged and analyzed. The pictorial data concerning Venetian ships and boats have never been adequately studied. This thesis, therefore, focuses on the medieval art of the Veneto region in order to present a catalog and analysis of the Venetian ship and boat representations dating prior to the second half of the 15th century.

The history of Venice and the style and media of her art are inextricably interwoven. As entrepôt between East and West, Venice adopted and fused into her own the artistic styles and media of both the Byzantine and European worlds. Not surprisingly, maritime images occupy a great deal of Venetian art. This fact reflects quite simply her reliance on seafaring.

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# CHAPTER I

## INTRODUCTION TO THE STUDY AND METHODOLOGY

### Introduction

Pictorial documents are a unique corpus of data providing invaluable information to the study of the history of ships and boats, yet these documents are rarely adequately studied. As so aptly put by Farrel (1979: 244), representational or iconographic source material "is of undoubted value to ship-archaeology but its value will only be realized if the material is recorded and discussed in its entirety." This study does just that for the medieval maritime art of Venice. It surveys the medieval art of the Veneto region in northeast Italy, and presents a catalog and analysis of the ship and boat representations from that region dating prior to the second half of the 15th century.

Venice, settled in the 5th century among the lagoons of the Adriatic Sea, was always a maritime nation. Enduring for more than a millennium as a dominant sea power, the Maritime Republic of Venice had a marked effect on the history of seafaring as well as trade. Three factors gave Venice advantages over other medieval trading city-states: the city's location, governmental policies, and the skills of her inhabitants. By the 12th century, Venice had become the prime trading center between the eastern Mediterranean and Europe. The geographical situation of Venice (a series of islands within a large lagoon in the northwest Adriatic) not only offered Venice protection from military attack, but an ideal location from which her merchants could import both luxury as well as essential goods from the east, and export those to Europe. The *Signoria*, the senate of the Venetian government, made trade a priority, and their policies resulted in communally controlled capitalism. Venice grew to become an integral trading agent between the European and Mediterranean world market.

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This manuscript conforms in style and format to the *International Journal of Nautical Archaeology and Underwater Exploration*.

By the beginning of the 13th century, the Maritime Republic of Venice had established her Arsenal, initially to make and store military supplies, but where, within a hundred years, a formidable military fleet was maintained and built (Concina, 1987: 11-12). Venetian policy on the ownership and operation of the merchant marine fluctuated continually between extremes: merchant galleys were either communally or privately owned and operated. For example, in 1314, state-subsidized and regulated galley voyages ran regularly to the North Sea (Lane, 1963: 180 and 185). Before the 14th century, however, merchant galleys were controlled by the private sector, although the Republic did regulate their construction as well as established various laws concerning their safety. Beginning in 1329, policy became more consistent: all merchant galleys were part of the State-maintained mercantile fleet and voyages were auctioned to the highest bidder (Lane, 1973 B: 129). Throughout the period under study, Venetian law dictated that all Venetian merchant galleys be designed so that they were convertible for use as war ships should the need arise. Thus the government encouraged, facilitated, and protected Venetian trade. The entire population of Venice was involved in maritime trade one way or another; their ship building, navigational, and mercantile skills made Venice highly competitive in the Mediterranean marketplace. Ships and boats were an integral aspect of Venetian life, and her astute merchants, mariners, and shipbuilders gained fame throughout the known world.

Venice's influence to the history of seafaring is profound. During medieval and Renaissance times, the Maritime Republic of Venice defined state-of-the-art warships and merchant vessels (Concina, 1987: 15), and their developments significantly influenced the later ships of exploration. The Venetian technology of ship construction contributes an indication of contemporaneous technology employed throughout the Mediterranean, as well as clues to better understand the subsequent ships that made possible the discovery of the New World.

All too little is known about the early vessels of Venice. Located medieval ship remains are scant, in fact, for all areas of the Mediterranean. Any vessels discovered are rarely complete, and often are not properly excavated and published. For the Veneto and adjacent Romagna region, the sole medieval merchant ship discovered and excavated thus far is the early 13th-century ship at Contarina (Contarina I), while the only warship located and investigated has been the 15th-century galley at Lazise (Lake Garda). To date, remains of only a few smaller boats have been excavated, with adequate reports published (at Cervia, Pomposa, Pontelagoscuro, and Logonovo). Clearly these few

examples can do no more than just begin to define the broad range of vessel types that were used in the Veneto during the medieval period. Written documentary sources concerning ships or boats are also rare and often unspecific. No Venetian technical ship construction treatises date earlier than the 15th century. Since these treatises were written for the masters in the shipyards, the "obvious" was often left out, making their interpretation today problematic. Six Venetian mercantile manuscripts or ship construction treatises from the 14th to 16th centuries provide information on contemporaneous ship types, and also help elucidate features of earlier ships.[1] Other written documents, such as maritime laws and shipping contracts, can also contribute to a better understanding of medieval ships.[2] The inherent problems of archaeological remains and the written documentary evidence, however, lead us to look beyond these sources for additional clues concerning Venetian vessels.

Invaluable information for medieval ships and boats can be found

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[1] The earliest known Italian manuscript dealing with ship construction is not from the Veneto, but is a notarial document from Brindisi (1275). Based on the data found in this document, Alvise Chiggiato has made line drawings of a typical 13th-century Italian vessel (1989). The earliest known Venetian document pertinent to this study is Zibaldone da Canal (ca. 1310-1350), a mercantile manuscript containing seven illustrations of lateen-rigged merchant ships. The contents of the technical manuscript Fabrica di galere probably date to ca. 1400-1420, although one extant version of the manuscript was actually rewritten at least 70 years later, and another version, Arte de far vasselli, dates to the 16th century. The manuscript primarily describes the merchant galleys of the state-regulated Flanders voyages, including descriptions of a lateen-rigged ship provided with both quarter and stern rudders (Anderson, 1945: 161) and a mixed-rig vessel (Bellabarba, 1988: 113-130 and 225-240). A technical book by Zorzi da Modon, also called Trombetta or Timbotta of Modon (ca. 1444-1449) discusses a contemporaneous galley, as well as an earlier type of three-masted lateener. Ragioni antigue (ca. 1480), a technical manuscript presenting a method of construction probably already in use during previous centuries, has provided the evidence with which Alvise Chiggiato has reconstructed line drawings of a 15th-century galley (Chiggiato, 1987: LVII-LXXIX). Istruzione sul modo di fabbricare galere (ca. 1540-1544) by Pré Teodoro di Nicolo, also discusses galley construction.

[2] The most important shipping contracts are those St. Louis negotiated with Venice and Genoa for crusader transport. These contracts provide us with the contemporary terminology used for various parts of a ship, including the masts, spars, sails, rigging, cabins, and other features of a medieval Crusader ship (Pryor, 1984). Maritime laws are likewise informative. For example, the 13th-century Venetian legal documents offer an idea of vessel size based on the specifications on the number and weight of anchors required for various ship types, and sometimes specify maximum dimensions (Predelli & Sacerdoti, 1903; see Appendix III for anchor specifications).

in the form of artistic representations of watercraft. Evidence gleaned from artistic representations supplements that found in the archaeological record and written accounts. Artistic portrayals of ships and boats are, in fact, the closest thing we have to photographs of ancient watercraft. With varying degrees of accuracy, ship and boat representations visually describe the general and technical features of vessels often not explicated in the other two forms of evidence. For example, details of rigging and superstructure are rarely preserved in the archaeological record, yet these are usually depicted in artistic representations of watercraft.

A unique corpus of representational data exists in Venice that has not been adequately examined by nautical archaeologists; consideration of this body of evidence is essential to attain a more complete picture of medieval Venetian watercraft. Scholars of northern Italian ships and seafaring to date, including Jal (1840), Casoni (1847), Lane (1934 and 1973 B), and Bonino (1978 A and 1978 B), have concentrated primarily on the archaeological remains and written documentary material. This study will instead focus primarily on the pictorial evidence, creating a catalog that will fill a gap in the current research.

The period under study includes a very significant shift in Venetian seafaring. During the 6th through the 8th centuries, Venetians traded throughout the lagoons of northeast Italy and along the nearby rivers accessing the mainland of northern Italy. By the 9th century, Venetians were traveling across the Mediterranean, reaching far abroad for better trading prospects. This expansion brought them great wealth, but also frequently led them into armed conflict (Lane, 1973 B: 1-11). This shift in the trading patterns of Venice must have resulted in the development of a wider diversity of ship types. The proliferation of distinct ship types (both in military and mercantile ships), and the change from primarily lagoonal and river craft to seagoing ships that occurred at the turn of the millennium is clear from the literature; surprisingly, this actuality is not reflected in the artistic record. Instead, there seems to have been a bias toward the representation of the round ship[3] over all other types (see graph on p. 241).

A revolution in ship technology occurred in the Mediterranean during the later Middle Ages, a series of innovations which developed over a period of about a hundred and fifty years between 1250 to 1400 (Lane, 1973 B: 118-124 and 1987: 238). The lateen-rigged ship (characterized by a triangular-shaped sail [see discussion, p. 209])

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[3] A beamy, high-sided sailing ship with two to three decks, adapted for the transport of bulky merchandise.

with two quarter rudders gradually was replaced by the square-sailed ship equipped with a single stern rudder. This improvement eventually led to the building of ships capable of ocean navigation and thus to the discovery and exploration of the New World. Vessels before this technological change, that is, lateen-rigged ships and boats, will be concentrated on in this study.

The fact that so few medieval ship remains have actually been discovered and studied in northeast Italy makes any extant representational evidence involving early Venetian ships all the more significant. Venetian artists must have seen ships and boats daily, and the portrayals they made of vessels are bound to reflect a greater degree of accuracy than maritime images made by inland artists. Even so, when interpreting artistic data, care must be taken to consider such art historical questions as: Did the artist trouble himself to be accurate in detail? To what extent was he controlled by stylistic or formal conventions, or by the limitations of his medium? What was the purpose of the ship or boat illustration? What areas of the image have been subjected to deterioration or restoration, and how has that affected the maritime image? These questions will be addressed generally in Chapter II, and specifically, as necessary, with each image presented in the catalog of Chapter III.

## Methodology

A systematic survey of the museums, churches, and the walls and architectural decoration of public buildings was undertaken in the Veneto region to collect all known representations of watercraft with traits of those prior to the nautical technological revolution. These lateen-rigged vessels continued in use even after the square rig had been introduced to the region, therefore, the cutoff date used in this study is ca. 1450. Utilizing Lorenzetti's Venice and its Lagoons (1982), I compiled a list of all the churches and museums of Venice to survey (Appendix II). Several other cities of the Veneto region were also surveyed. For these, The Blue Guide to North Italy (Macadam, 1987) was used. Each location with potential for medieval art was visited and searched thoroughly for any representations of maritime themes. Experts on specific sites, such as museum directors, curators, procurators, or priests, were consulted whenever possible. Dr. Maria Urbani and Dr. Antonio Meneguolo, procurators of San Marco, Admiral Carlo Gottardi, director of the Museo Storico Navale, Don Sandrini, priest and librarian at the Seminario Patriarchale, and Dr. Ennio Concina, professor of Architecture and scholar of Naval Architecture, were extremely helpful

in locating and dating unpublished Venetian maritime images. The most fruitful locations for artistic representations of ships or boats proved to be mosaics and frescoes decorating church walls, predella panels (paintings that originally decorated altars, that today are often part of museum collections), manuscript illuminations (in libraries and private collections), while graffiti are particularly common by the main entrances of churches, either on columns or on the portal itself, and on the walls of quarantine locations or prisons.[4] Less fruitful sites for maritime representations included church sacristies and architectural sculpture.

Venice is a city of museums and churches. It is therefore probable that some ship or boat representations have been overlooked, particularly images in museum storage, or in libraries and manuscript collections, which were impossible to survey completely. Also, some medieval churches have been destroyed, permanently closed, or are now private property, and were therefore impossible to survey (see Appendix II for list of the libraries, museums, and churches visited, closed or lost). Nonetheless the catalog of images resulting from this research presented as Chapter III is fairly exhaustive for Venice, gives an adequate representation of the maritime art of Ravenna and Aquileia, but is less complete for the rest of the region. Surveys of Venetian art after 1450, as well as art in Venetian colonies of the Adriatic and the eastern Mediterranean would prove extremely valuable, especially for art of the most naturalistic periods, but have not yet been undertaken.

After a ship or boat image was located, I wrote a letter to the appropriate institution requesting permission to photograph the maritime art. When permission was received, the ship or boat image was photographed with a Nikon FM2 camera and a 60 mm. micronikkor lens. Documentation was made on Ilford FP4 black and white film (exposed with flash at 125 ASA), Kodak TMax black and white film (exposed under natural lighting, rated at 1600 or 3200 ASA, as necessary), Kodachrome slide film (exposed with flash at 64 ASA) or Kodak Ektachrome 160 Professional Tungsten color slide film (exposed with flash and an 85b filter at 100 ASA), and 3M Scotchchrome 1000 color slide film (exposed under natural light, rated at 1000, 2000 or 3000 ASA, as necessary). Whenever feasible, the camera was steadied on a tripod or other stable surface. When I was unable to make original photographs, photographic

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[4] The graffiti located during this survey all seem to post-date 1450 and are not included in the catalog, although a few, thought to date before the end of the 15th century, form part of the typology developed and graphed in Chapter IV.

images were purchased from the museum, church, or photographic agencies, or were reproduced, with permission, from published sources.

Maritime images were further documented through written descriptions taken on site, following a check list of the pertinent nautical features. When it was deemed necessary to record greater detail, sketches or rubbings were made. Measurements of the maritime images were not taken. They were not pertinent to this study for two reasons: Primarily, the diversity of media and different modes of representation used in Venetian art, including some which are never realistically proportionate, make relative measurements irrelevant. Second, often the maritime image could not be feasibly measured due to its location (e.g., wall mosaics).

Pertinent historical, economic, and art historical factors are discussed in Chapter II. Representations of ships and smaller vessels located during this survey are cataloged and discussed in detail in Chapter III. Specific aspects of each vessel, including construction details, the stern configuration, rigging, and anchors, are topics for discussion. Where possible, details of technical features are clarified by comparison with other representations, written documentary evidence, and archaeological remains. In Chapter IV, general conclusions are drawn regarding specific features of Venetian watercraft, including discussions of the lateen rig, construction techniques, common stern designs or configurations, steering devices and their mounts, and anchors. A typology of medieval Venetian ships and boats is also developed in this final chapter by placing the represented ships and boats into recognizable categories based on size, design, and function. In this way, an indicative cross section of the range of types employed in the Veneto region during the medieval period, from small coastal and lagoonal craft to the larger lateen-rigged merchant ships and galleys, is attained. Since Venetian ships are likely to reflect the contemporaneous Mediterranean nautical technology, this study reveals specific aspects of Venetian ship and boat types, but also contributes to the general understanding of medieval rigging, hull construction, and the late medieval iron anchor in the Mediterranean.

# CHAPTER II

## A BRIEF OVERVIEW OF VENETIAN HISTORY AND ART

This chapter consists of three sections. First, aspects of Venetian economic history that are pertinent to this study are summarized (see Appendix IV for a chronology). Next, the history of Venetian art to the beginnings of the Venetian school, which includes the art up to the mid-15th century, is considered. This section includes a discussion of the media employed by Venetian artists, the techniques and limitations of each medium, and a brief overview of the most prevalent maritime themes in Venetian art. Finally, factors affecting the availability and type of ship and boat depictions found in Venetian art are addressed.

### History of Venice

The lagoons of Venice were first settled by refugees fleeing from a series of barbarian invasions that devastated the cities of northeast Italy: the Goths and Attila the Hun invaded in the 5th century; the Lombards in A.D. 568 (Norwich, 1982: 4-5 and Langer, 1940: 164). Gradually numerous islands of the Venetian lagoon were inhabited, and a rudimentary system of self-government evolved. The city's location within the lagoonal system provided some measure of security from attack, as well as a means of livelihood for the inhabitants.

Initially the economy of Venice was based on trade in fish and salt, commodities that Venetian merchants marketed first in territories of Ravenna and the Pentapolis along the Adriatic coast, and later, up the rivers of northeast Italy (Luzzato, 1961: 3-4). By the 8th century, Venice had gained control of the Veneto plains (Fasoli, 1978: 592-595), and, at least until the end of the 10th century, monopolized trade along the Po River, one of the primary trade routes to trans-alpine Europe[5]. Venetian traders supplied the inland inhabitants not only with locally produced salt and fish paste, but also with exotic merchandise obtained from eastern merchants, including spices, silk, ivory, precious furs and

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[5] The major riverine systems of Europe during the Medieval period were the Danube, Ebro, Garonne, Loire, Val Padana or Padània (Po system), Rhone, Rodano and Saône. Most important to Venetians were the deep rivers of the Po system, including the Livenza, Piava, Sile, Brenta, Bacchiglione, the Adige, and particularly the Po, especially the deep Po of Primaro and Po of Volano (Fasoli, 1978: 567-592).

stones, and purple-dyed cloth. Venetians always employed a variety of ship types, but as long as they were primarily river and lagoonal traders they depended especially on barges, leaving the Mediterranean traffic to foreigners. As it went upstream, a barge's cargo was frequently transhipped to the type of vessel best adapted to the demands of regional navigation (Fasoli, 1978: 566).

Venice was ideally located for trade, and provided the essential link for the maritime and land-river commerce between the Levant and Europe. Venetian citizens grew rich by providing a marketplace for exchange between east and west (Lane, 1973 B: 5). The economy of Venice was further strengthened around the turn of the millennium as Venetian mariners and merchants travelled seaward and into the eastern Mediterranean. The Venetians' superior supply of wood, which was still plentiful on the mainland of the Veneto as well as from her colonies along the Dalmatian coast, now provided their primary means of exchange (Lane, 1973 B: 8). This abundant wood supply was essential to the building of the larger and stronger seagoing ship types. Traveling beyond the Adriatic Gulf and the riverine system of northeast Italy, Venetian merchants traded directly with the peoples of the Levant, Black Sea, Crete, and Alexandria for luxury goods from the Far East, as well as for slaves and necessary staples, including iron, copper, tin, mercury, soap, leather goods, coarse textiles, grain, oil, wine, fruit, live animals, and slaughtered meat. Such goods were obtainable at ports of call all along the eastern Mediterranean route. Venetian trade in the east began in the 9th century; by the 12th century, the economy of Venice had peaked (Lane, 1963: 179).

The strength of Venice's economy was further enhanced by the fact that throughout most of her history, despite severe competition at different times from Genoa and Pisa, as well as competition with the Arabs, she managed to arrange advantageous trade agreements not only with both Latin and Byzantine Christians but also with the "infidels," the Fatamids, and the Ottoman Turks (Demus, 1988: 5 and Langer, 1940: 195 ff.).[6] Foremost among these was her longstanding affiliation with Byzantium, which afforded her trading privileges throughout the Byzantine Empire in exchange for Venetian naval support of the Empire. A treaty established between Charlemagne and Byzantium in 812 resulted in additional trading advantages for Venice in northern Italy (Lewis, 1951: 107 and 217). By the mid-9th century, Venice was exercising her independence by trading with Syria and Egypt, despite Byzantine

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[6] For other treaties, see Langer, 1940: 239, 267, 269, 271, and 275.

regulations against it (Lewis, 1951: 116). Venice continually traded with the Moslems in Sicily, North Africa, Syria, and Egypt. A renewed agreement with Byzantium in 992 (Langer, 1940: 195 and Martin, 1979: 111) imparted to Venice a virtual monopoly of the west-bound trade in the eastern Mediterranean, while the trade policy of Otto III of Lombardy in 996 effected a near Venetian monopoly of the eastern trade of Northern Italy as well (Lewis, 1951: 218). Venice was the only trading nation that actually succeeded in establishing and maintaining trade relations with all sides, an enterprise that required much diplomacy and some military aggression. The Venetian government not only developed a mighty navy, but also regulated the construction of merchant galleys to ensure that these merchant ships would not be too unwieldy to serve as effective warships. Like their Byzantine predecessors, Venetian galleys were slender (with a length : beam ratio of 8 : 1), had only one deck, and relied primarily on oared power. Other governmental policies were designed to keep capital in the hands of the people (thus facilitating their mercantile activities), and to provide Venetian merchants with the safest shipping and cheapest freight rates possible (Lane, 1973 B: 125 and 1963: 197 and 202). Through the support of these prevailing policies as well as through the support of the navy, Venice rose to become the strongest mercantile nation of the Middle Ages in the Mediterranean. Maintaining both colonies and trading stations throughout the Adriatic and eastern Mediterranean, Venice became a virtual maritime empire.

Another great source of wealth for Venice proved to be the Crusades. Many pilgrims preferred to book passage on a ship rather than to risk the slower and more dangerous land route. Because Venice's location was relatively convenient to much of Europe, the city was one of the most popular ports of departure. The Fourth Crusade was more profitable to Venice than all the other Crusades combined. Geoffrey de Villehardouin of Champagne, France, contracted Venice to carry 33,500 French Crusaders for a total sum of 85,000 marks of silver (de Villehardouin, 1204; Marzials, 1965: 131). A large part of the 300-fleet flotilla, including horse transports, was specially built for the campaign. By the departure date, however, only a third of the anticipated Crusaders had actually appeared in Venice, and they were able to come up with only half of the huge sum due. Rather than breaking the contract, Venice renegotiated with the Crusaders, who agreed to sack Zara and Constantinople en route as partial payment for their passage (Lane, 1973 B: 36-37). Venice reaped payment fourfold: the fares were eventually fully paid; she regained control of her unruly

colony, Zara; she obtained a chain of colonies stretching all the way between Venice and the Black Sea; and she received half the booty from the seizure of Constantinople in 1204.

The last two boons, the additional colonies and the plunder, had other long-term effects on Venice. Until this time, the Byzantine government had carefully regulated Black Sea trade; all ships passing through the Bosphorus were required to unload in Constantinople and offer their wares for sale. The Byzantine motive had been, quite simply, to keep the city supplied with essential grain, especially important since the 9th century loss of its previous sources of grain, Egypt and Sicily, to the Arabs (Lewis, 1951: 82 and 109). After 1204, however, Venice had free access to the Black Sea, and her trade there certainly expanded.[7] The timing was ideal for Venice, for by the mid-13th century, the final stop of caravans from China had shifted from the trading centers along the Levantine and Egyptian coasts to Trebizond, along the south-eastern shore of the Black Sea (McNeill, 1974: 35-36). By the mid-13th century, Venetian trade was flourishing in the Black Sea as well.

The last benefit, the spoil from Constantinople, indirectly brought Venice further gain: reliquaries and other art objects only increased Venetian prestige, making the city an even more popular pilgrimage center. Venice eventually came to possess relics of saints Matthew, Mark, Luke, John, Peter, Bartholomew, Anianus (Mark's disciple, and Bishop of Alexandria), Helena (mother of Constantine) and other, less famous saints, including Isidore, Hermagoras and Fortunatus of Aquileia (Mark's disciples), Cornelius, Cyprianus, Hippolytus, Cyrillus, Stephen, Clement, Blaise, Sergius, and Bacchus (Demus, 1988: 2-3).

Beginning in the late 13th century, Venice expanded her trading influence even further abroad, competing in European trade as far north as Flanders and England (Langer, 1940: 240). No doubt this expansion was partially a result of the rapid progress being made in techniques of navigation and shipbuilding which Lane has called the Nautical Technical Revolution (Lane, 1973 B: 118-124). Port books were conceived of in circa 1250; they listed various bits of information, including the distances and directions between ports. Within twenty years, four additional innovations made even winter sailing feasible in the Mediterranean: marine charts, the magnetic compass, the traverse table,

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[7] Many scholars maintain that before 1204, Venice was denied access to the Black Sea, although Martin (1979: 113) has shown that in fact, at least a century previous to the Fourth Crusade, Venetian merchants already traded in the Black Sea, although certainly more intensely so after the Fourth Crusade.

and the hourglass. The first marine chart was created with the data of port books: The data of the port books was presented graphically by strictly mathematical methods, thus graphically defining the coastlines with the positions of ports. On the charts, the compass rose, with its radiating rhumb lines, enabled a mariner to plot his course and follow a compass bearing, and the traverse table helped the mariner to reduce zigzag course lines to a straight line. By the end of the century, portolan charts, compasses, and traverse tables were in common use (Lane, 1973 B: 119-120). The use of both steering devices and rigging was facilitated by the addition of pulleys or levers. Beginning in the 14th century, a single rudder, attached with iron pintles and gudgeons to the stern, began to replace the two quarter rudders of earlier ships. A final important development occurred around 1300. The trireme, or merchant galley, a new enlarged type of oared galley supplemented with more sail power, gradually replaced both the light bireme galley used to transport precious cargo, as well as the round ship employed for the more bulky merchandise (Lane, 1934: 14). This great merchant galley had a fuller, more spacious, hold than normal galleys, and her oars and armed men could guarantee a speedy and safe delivery of both the luxury and the bulky goods. The merchant galley, as an excellent compromise between the long ship and the round ship, became the most important cargo carrier. After 1314, regular state-subsidized and state-regulated convoys of merchant galleys were sailing westward and northward to trade in the North Sea, and east to Syria or Cyprus, Romania (Black Sea), and Alexandria (Lane, 1963: 180, and 1973: 125). Venice, was by now one of the largest cities in Europe and in her prime.

In the early part of the 14th century, Venice eliminated her dependance on imported food by gaining control of Padua and Treviso on *Terraférma*. But the 14th century also brought Venice a series of devastating hardships. Much of the city was damaged by an earthquake in 1347. The plague followed, reaching Venice in 1348, decimating nearly half of the population of Venice (Hibbert, 1988: 48) within three years, and reducing the total population of Europe by at least one third, resulting in a dramatically shrunken market (Kedar, 1976). Almost immediately thereafter, war with Genoa brought continued suffering that finally abated with the Venetian victory at Chioggia in 1381. This victory established Venetian control of the Levantine trade and reestablished her dominion over the Hellespont and the Black Sea trade (Langer, 1940: 322). Venice now held strongholds along the Dalmatian coast, on the Peloponnese, Corfu, and on nearly all the Cyclades and Dodecanese islands.

By the 15th century, Venice was firmly established on *Terraférma*, controlling territories extending all the way inland to Lake Garda. At this time, the Ottoman Turks began to challenge Venice for control of Aegean trade. Their threat prompted Venice again to war. This one endured through the 17th century, although it culminated with the Battle of Lepanto in 1571 of the previous century. Even though Venice was nominally victorious at Lepanto, the losses and costs of the war were severe. Worse still, Venice failed to follow up on her victory, and by the 17th century, Venice had in fact lost control of most of her colonies to the Ottomans.

The influence of Venice began to diminish in the 16th century. A combination of factors caused her eclipse. Most important were the expanding naval powers of the Ottoman and Spanish empires (Lane, 1973 B: 248), a shortage of oak timber for shipbuilding in Venetian domains, and competition from the Portuguese expansion in the spice trade. Finally, the Dutch acquisition of the Spice Islands early in the 17th century was more ruinous to the Venetian economy than Portuguese expansion ever had been (Lane, 1973 B: 294).

The later history of Venice, with the exception of its continually profitable tourist trade, is a history of decline. By the end of the 16th century, Venice had weakened drastically as a mercantile state, but in the 17th and 18th centuries, Venice gained fame as a pleasure city, and she began to flourish again with the influx of tourists. Yearly, their numbers grew, drawing from the aristocracy of all Europe, but especially Englishmen engaged in the Grand Tour. They came to have their portraits made; to enjoy the opera and concertos (such as those of Vivaldi); the theater, the carnival, prostitution, and gambling; to buy the products of Venice, such as lace, glass, and books; and to appreciate the exceptional beauty and festive spirit of the water city.

Although Venice was no longer a powerful maritime state, the city was still independent and functioning as a center of shipping until Napoleon's occupation, when he systematically plundered the city between May and October of 1797. Many monasteries and churches were closed, their valuable art moved to Paris, while works of "lesser" merit were destroyed. In October of 1797, Napoleon temporarily transferred Venice to Austrian control until 1805, when he reoccupied the city. Venice was then subject to French occupation for another decade (Lane, 1973 B: 421, 436). By the time she regained her independence, Venice had lost most of her art, and was completely ruined as a center for shipping.

The city today, though still magical, is overpopulated, and completely devoid of any industry besides tourism; it is a city living

on its past, with overwhelming problems in the present. The nearby mainland city of Mestre provides the only other source of jobs, primarily in the chemical, petroleum and plastics industries. These industries have however caused extreme pollution problems in the lagoon and the city. In the 1930's, electric pumps were introduced to pump water from the subsoil for industrial and agricultural purposes. This, combined with geological factors, has caused Venice gradually to sink and be subjected to periodic flooding. At present, plans are being implemented to improve or control these problems, and to preserve the unique city of the Republic of Venice.

## The Art of Venice

Unfortunately, much of the art of Venice has been lost or relocated. The earliest known Venetian art dates to approximately the 10th century, although earlier Roman art, such as the 4th-century floor mosaics in the Cathedral of Aquileia, still exists in the region.

Stylistically, the art of Venice was greatly influenced by the Byzantine style, which in turn was affected by that of Late Antiquity. Venice was one of the most important centers for the diffusion of the Byzantine style in the west (Christe, et al., 1982: 131 and 256).

In early Byzantine art, the primary medium for artistic expression was mosaic. The primary function of art was religious: artists concentrated their efforts on ecclesiastical decorations, votive offerings, or dedicatory images commissioned by private individuals or guilds. Artistic images were both didactic and decorative.

Byzantine religious art was therefore far from being *ars gratia artis;* artistic creation was an act of piety, and a spark of the divine essence was believed to be present within the material image. Icons were intended as

> a means of creating conditions of interior life favourable to meditation, indeed to a state of illumination conducive to "truth." Hence those great gold grounds, empty, uniform and glittering, veritable sheets of light upon which are projected figures that are impassive and serene. The figures have no individual characteristics, and the devices used to portray them are rhythmical line, symmetry, elongation of the silhouette, two-dimensionality and a conventional treatment of drapery; they have no real relation one to another or to inanimate objects (Christe, et al., 1982: 131).

The tendency toward simplification and stylization of the subject matter, which is inherent in the mosaic medium, was particularly appropriate. Art within the place of worship was intended to intensify

religious feeling, to heighten one's awareness of the spiritual world. Realism was neither desired nor expected. Biblical figures and saints were stiffly represented, with a minimum of movement, upon a gold background, which totally divorced them from earthly reality. In all media, inanimate objects such as ships and boats were likewise represented in a stylized, simplified manner: curved hulls with voluted ends reveal little about actual vessels: images, as so aptly put by Farrel, where "symbolic intent can displace realism completely (1979: 237)," that were statically repeated over time.

Even when most strongly influenced by Constantinople, however, Venetian art was never completely Byzantine. It was a unique synthesis of both Byzantine and western art stylistic traditions, combined with completely Venetian characteristics. While modeling techniques, formulaic compositions, and the style of figural representation show the impact of Byzantium, Venetian representations are even further simplified and generalized. Venetian qualities include "a subtle colorism, a sense of rhythmic composition...and the penchant for the decorative, for splendor and sumptuousness, the striving for harmonious beauty (Demus, 1988: 200)."[8] The eventual appearance of true perspective, the interest in emotion, and the sculptural rendering of form derive from western influence.

In the 13th and 14th centuries, narrative subjects, well exemplified by the art of Giotto, commonly appear in Italian art. Human figures were depicted in a completely new vernacular way, one which exhibited a fascination with the real world (Folda, 1976: 40). In contrast to the figural representations of the early medieval world, figures were shown in motion, and their faces reveal their emotions. The biblical, hagiographical (concerning the lives and miracles of the Saints), and liturgical (portraying rites of the liturgy) cycles were expanded with new episodes, and radical new themes included the portrayal of the day-to-day activities of man. Fifteenth-century themes manifested an even greater degree of naturalism and humanization. Through the use of perspective, human figures were firmly linked to natural surroundings, and both emotion and motion were more convincingly depicted. This new mode of portrayal was effectually accompanied by an increased use of panel painting over the mosaic medium (Steer, 1970). This narrative trend is exemplified in Venice by the art of Paolo Veneziano and Jacopo Bellini. Paolo Veneziano (the first Venetian

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[8] For an excellent summary of the development of mosaic art in Venice, see Demus, 1988: 188-202.

artist known by name), and his school, were clearly influenced by Giottesque technique, but still reflected Byzantine convention and refined style. The change of primary media most common by the Renaissance, that is, painting and sculpture, also reflected the new aims of artists and their patrons. Painting and sculpture allow for a much greater degree of realism than mosaic or enamel.

Prevalent themes in Venetian art included biblical, hagiographical, and liturgical cycles. Historical events also became popular themes in Renaissance times, with preference shown for those events which portrayed the glory and power of Venice. Always the intention was fourfold: to decorate, to inspire, to teach, and to impress.

The State promulgated certain legends for political and economic reasons. For example, after Venice had obtained the relics of St. Mark in 829 (Kaftal, 1978: 668) and those of St. Isidore in 1125 (Kaftal, 1978: 429), the portrayal of the legends of these two saints became and remained particularly popular themes. Such subjects not only inspired veneration but also promulgated political and economic incentives. The veneration of saints' relics drew pilgrims and therefore tourist moneys to Venice. But the illustration of scenes from the life of the apostle Mark and his transport to Venice also gave validity to the city's possession of his relics, and to her claims to the Patriarchal seat. Another basis for the popularity of cycles of SS. Mark and Isidore was that St. Mark had became patron saint of Venice, while St. Isidore had been chosen as school patron saint by the carpenters of the Arsenal.

By the 13th-century, the function of art in Venice had become political as well as religious (Zampetti, 1969: 28). This is evident, for example, in the Cathedral of San Marco and the adjacent Ducal Palace. Previously considered the Doge's private chapel, San Marco became the repository of politically important trophies garnered by the State in its military ventures. San Marco became the church of the State and of the people (Demus, 1988: 2). The increasingly political motivation in Venetian art is also evident in the decorative mural paintings of the Ducal Palace; numerous naval battles glorifying the city's impressive naval strength are seen in every room.

The period with which I am dealing came to an end with the beginnings of the Venetian school. This new mode of representation was more realistic and emotional. This style broke free from previous Gothic and Byzantine traditions, and embraced many of the characteristics of Renaissance art. But it is uniquely Venetian in its flamboyant, exotic style, and, after the 15th century, its revolutionary

use of light. One of the major fathers of the Venetian School is Jacopo Bellini, who had apprenticed under Gentile da Fabriano of Florence. Bellini greatly influenced Carpaccio, who is also considered one of the founders of the Venetian school. Numerous later Venetian painters have also dramatically affected the history of art with their unique styles and interpretations of the Renaissance and subsequent mannerist movements: Andrea Mantegna, Gentile Bellini and Giovanni Bellini, Giorgione, Tiziano (Titian), Bartolomeo Montagna, Tintoretto, Veronese, and Canaletto; likewise, the architects: Sansovino, and Palladio (Hibbert, 1988: 104-155 and Chastel, 1963: 246-262 and 353-364).

**The Artistic Media**

The most common media of medieval Venetian art are mosaic, enamel, manuscript illuminations (also called miniatures), and line-drawn illustrations in technical treatises, frescoes, painting, and several forms of sculpture (relief work in metal and stone, and engravings). Until the 12th century, most art was executed in mosaic, with some in enamel and as manuscript illuminations. As discussed above, art was stylized, and only gradually became more realistic as the function of images changed. As the function of art changed, the favored media changed as well, from mosaic, enamel and illuminations to the potentially more detailed and naturalistic media, fresco, oil painting, and sculpture. Painting and sculpture became more common beginning in the 12th century, and were key tools used to create a more convincing depiction of three-dimensional reality. The following section will discuss each medium and its major advantages and limitations.

**Mosaic.** In mosaic, an image is defined with colored, highly reflective pieces of glass called tesserae. Venetian mosaics utilized unusual tesserae forms, such as round and teardrop shapes (Demus, 1988: 38). The pieces of color are juxtaposed and any blending accomplished by the eyes of the viewer, rather than pigments blended. Although the resulting images can not perforce be essentially realistic, it is an ideal technique for depicting the spiritual quality of themes popular in early medieval art. Byzantine-style mosaics were almost invariably placed on the wall, usually far above the observer's head. Demands of visibility therefore required that the artist utilize larger stones, and this forced him to execute fairly simple designs (de la Croix and Tansey, 1980: 218). The resulting images were necessarily geometrical, simplified, and one-dimensional. The lack of physicality or of any illusion of three-dimensionality resulted in a further spiritualization of a theme, and sometimes in errors of perspective, which apparently

worried neither mosaicist nor viewer.

Crucial to consider when analyzing mosaics in Venice are the restoration techniques employed. Within a century of their creation, mosaics had often begun to crumble and decay. By the mid-14th century, mosaics of San Marco had already started to deteriorate, a continuing problem to this day. Repairs, first initiated late in the 15th century, have been carried out continually ever since, with varying degrees of accuracy and success. Often earlier mosaics were completely replaced with compositions in a contemporaneous style. In the 1880's and 1890's, mosaics were repaired by being completely removed and then reapplied, resulting in numerous inaccuracies. A more accurate method was developed in 1937 and 1938: the mosaic crust was kept *in situ* on a specially constructed support, and the masonry behind it was removed brick by brick and replaced (Demus, 1984, vol I: 75). The method and exactness of restorations would have affected the accuracy of any ship and boat representations.

**Enamel.** As with mosaic, an enamel image is defined by juxtaposing pieces of colored material; images are consequently very stylized. With enamel, however, the colors are produced by using small pieces of millefiore glass cut cross strand, or by mixing or adding various compounds such as oxides to other vitreous material, which is arranged on or in a metal background, and then fired to fuse the colors. An enamel of the *Pala d'Oro* (the fig. on p. 85), for example, depicts a small round ship under sail in a very stylized manner, in part because of the enamel technique. Since enamels were made of small tesserae, intended to be viewed at close range, they are potentially more detailed than mosaics.

**Manuscript Illuminations.** The limitations of the illuminated manuscript medium are similar to those of the paint medium. Since manuscript illuminations are always miniatures, and often defined through line with little shading, usually less detail is portrayed than with paint. There is, naturally, a broad range of quality, realism, and accuracy in the extant illustrations, depending on the skill of the artist (Farrel, 1979: 237). A serious problem with manuscripts is how well the paint has remained bonded with the parchment.

Until the 11th century, religious miniature were characterized by humanization, combined with an "intense spirituality and sumptuous colour (Christe, et al., 1982: 132)." Then the style of miniatures became more ascetic. Figures were schematically portrayed to appear dematerialized and otherworldly. Manuscripts of nonreligious themes grew more popular, and were likewise decorated with miniatures. Since

the medium developed within Byzantine monasteries, and as styles persisted due to intense copying of manuscripts, these later miniatures were influenced by the style which had already developed (e.g., the figs. on p. 95 and 96). Other media, particularly the mosaic medium, were also strongly influenced by manuscript illumination style. In fact, illuminated cycles illustrating Byzantine manuscripts were used as models for Venetian mosaic cycles (Demus, 1988: 14).

**Fresco.** The usual method of creating frescoes is to paint upon wet plaster. Since the artist must apply the image to the wall before the plaster dries, the image must be rapidly executed, and the results can appear spontaneous and often impressionistic, although they can be quite naturalistic. Frequently fresco was used to fill large spaces by depicting large heavy forms filled with large areas of color.

A few very poorly preserved examples of frescoes from the 13th and 14th centuries were located in this survey (Figures 63-72). Frescoes do not survive well in the damp lagoonal environment of Venice, and Venetian artists tended to utilize other media.

**Painting.** No examples of paintings exist from the early medieval period; the earliest painted images found in this survey date from the first decades of the 14th century, when the shift in emphasis from wall mosaics to painted polyptychs gradually occurred. Besides the obvious technical improvements characteristic of painting, this new emphasis reflects an important psychological change toward humanization. Instead of remote and enormous mosaic figures placed in the upper reaches of the building, the Holy Figures were being shown in more naturalistic paintings displayed at the viewer's level (Steer, 1970: 15). The figure on page 167 illustrates this trend well: The faces of St. Mark, the mariners, and details of the hull and rigging of the ship are realistically portrayed.

The paint medium allows for greater and more detailed accuracy than most other media, in fact, as much as the artist desires or the style demands. Because the resulting image is generally one-dimensional, however, painted representations have limitations for the purposes of scholastic interpretation in that (especially in the art before the 15th century), a lack of understanding of naturalistic perspective can result in serious misinterpretation of form.

**Metal and Stone Sculpture.** This category is broadly defined as sculpture, but includes various techniques and materials, including stone, ivory and metal, worked in shallow bas-relief (almost one dimensional), the more complex techniques of repoussé, or vermeil, or a completely three dimensional sculpture. Before the 13th century,

sculpture was relatively rare in Venice (or perhaps simply little has been preserved). Sculpture became more prevalent in the 14th century; with the increased pursuit of more realistic portrayal, both in terms of subject matter and a more convincing representation of physical form. Carving techniques lend themselves to more realistic portrayal, since, by showing a subject in relief, the artist is better able to define a three-dimensional form (Christe, et al., 1982: 134).

Despite its potential for realism, sculpture is still limited by the coarseness of the raw material. Carving in stone and wood can both result in a certain degree of simplification of details (e.g., the figs. on pp. 199 and 200). The application of vermeil (silver gild) or gilding finish to wood carvings or metal relief work served to make them sumptuous, though perhaps less realistic (Christe, et al., 1982: 255) (see the figs. on pp. 200 and 205).

Wooden sculptures were usually hollowed out, and then painted and gilded. Initially, the gilding was simply applied in sheets. Later, two more effective techniques, water gilding and oil gilding, were used. Water gilding produced a very high luster. Bole (a red clay), with a bit of glue in it, was applied on top of the gesso layer. Then small squares of gold leaf were set, polished, and burnished. A second technique is oil gilding. With this method, the gold leaf was applied on a layer of oil. This produced a very weak adhesion which could not be burnished, but effected a matt surface (Jack Soultanian, Conservator, The Metropolitan Museum of Art and the Cloisters, 1/31/91).

The unique advantages and limitations of each medium must be considered as one analyzes the maritime art of Venice. Generally stated, the earlier art, usually in mosaic and enamel, produced very stylized ship and boat depictions. Improvements in techniques, especially within the paint and sculpture media, resulted in more accurate and detailed images of watercraft. Furthermore, one must be cognizant of the possibility of an archaizing tendency - that is, when artists intentionally portray the setting anachronistically to give the impression that the events depicted occurred in the past. Finally, the function of the art, and the skill of portrayal, should be considered.

The most common maritime themes encountered in Venetian art will now be discussed to complete the background for the catalog presented in Chapter III.

**Prevalent Themes in Venetian Art**

Based on my research, the prevalent themes found in Venetian art of the period covered by this thesis can be divided into five main

categories: biblical themes (both Old and New Testament); liturgical themes; hagiographical cycles; and historical and miscellaneous illustrations. Maritime themes are predominant in all categories except the liturgical; clearly ships and boats were an intrinsic part of the historical, legendary and biblical stories most important to Venetians.

The biblical maritime themes most frequently depicted in Venetian art include Noah and the Ark (Genesis 6-8), Jonah and the Whale (Jonah 1:3-17), the Calling of Peter and Andrew (Luke 5:10-11), the Miraculous Draught of Fishes (Luke 5:1-10 and John 21:1-11), the Stilling of the Tempest (Matthew 8:23-27; Mark 4:35-41; Luke 8:18-27), and Christ or Peter Walking on Water (Matthew 14:24-33; Mark 6:45-52; John 6:16-21). Biblical themes were illustrated in all media, but were particularly important themes in the mosaics covering the walls of medieval churches, functioning as a visual means to teach the Bible to the illiterate masses. The medieval Noah's ark images located through this search portray a symbolic, imaginary, box-like vessel, with no value as a reflector of contemporary Venetian types (see, for example, the atrium mosaics of San Marco, in Demus, 1988: 135, fig. 69). Noah's ark images have therefore not been included in the catalog. The other biblical maritime themes seen in Venetian art are often more realistic and consequently relevant to this study.

A ship or boat image is often part of some system of symbols (iconography), but occasionally the vessel image simply signifies "boat" or "ship." An example of the former is the mosaics of Noah's ark depicted in the atrium ceiling of San Marco. The representation of the ark is hardly ship-like at all, however, the image of the ark implies far more than just the biblical story of Noah and the ark. Iconographically, the Noah story generally signifies God's provision of salvation. In this case, the mosaic portrayal expresses the early Christian interpretation of the Noah legend: God's provision of salvation from eternal death is promised to the individual man (Newton and Neil, 1966: 9). On the other hand, 13th-century sculpted portrayals of craftsmen (ship builders and fishermen) with their respective boats, located in the main portal of San Marco (e.g., the figs. on pp. 197 and 199) are represented not as symbols but as portrayals of actual Venetian vessels.

Maritime episodes occur in the legends of four saints frequently depicted in Venetian art. By far the most important saint to Venice was St. Mark, followed by St. Isidore, and, of lesser significance, SS. Ursula and Clemente. Hagiographical cycles were ostensibly depicted to inspire the viewer to emulate the lives of saintly men and women. There

were often subtle though significant political motives as well as spiritual ones. For Venice, the most important of these is found in the regular depiction of the St. Mark legend. At the most basic level, Marcan cycles (episodes depicting legends concerning St. Mark), besides inspiring saintly living, affirmed in the minds of Venetian citizens that St. Mark, as patron saint of their city, could be appealed to for direction, protection, and health. At the political level, however, the depictions of Marcan cycles stated far more, as will be explained in the following section. They were an attempt to validate the claims of the State of Venice to the remains of St. Mark and an effort to promote the pilgrim trade.

Venetians held St. Mark, the Disciple of Christ who became the missionary to Italy and the north Adriatic and founded the Patriarchate of Venetia at Grado, in high regard. Venetians considered themselves to be directly descended from this apostle, so naturally devotion to this saint was particularly strong in Venice, and led the Venetians to exonerate themselves from the sin of robbing Alexandria of St. Mark's relics. Maritime scenes from the *vita* of St. Mark include episodes from his various missions, including ship voyages to Aquileia, Rome, Pentapolis, and Alexandria. According to a Venetian version of his *vita*, his ship moored in the lagoons of Venice during his voyage from Aquileia to Alexandria. While there, the saint had a dream-vision in which he learned that his bones would eventually find their final resting place among these lagoons. This legend originated in the first half of the 13th century and became a frequent cycle in Venetian art. It validated the *praedestinatio* legend, asserting as it did the city's divine right to possession of the relics (Demus, 1984, vol. II: 188).

The legend of the *translatio* goes further back in Venetian history. According to legend, in 828, two Venetian merchants, Tribunus and Rusticus, "just happened to have been driven off course to Alexandria," a predicament which justified their breaking the trade embargo Venice had declared against the infidels.[9] While in Alexandria, the merchants overheard that the caliph had plans to destroy the church which housed the relics of St. Mark. The merchants persuaded the priest of the church, Theodorus, to relinquish the relics to Venice. Once loaded aboard the Venetian ship, the miraculously sweet smell emanating from the saintly remains aroused the suspicions of the custom officials in the harbor. The men sent to investigate were Moslems, and sufficiently squeamish about investigating the basket of pork in which

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[9] It is likely that such illicit trade was frequently engaged in by Venetian merchants (cf. Norwich, 1977: 28 and Bragadin, 1978: 407).

the remains were disguised. Thus the officials failed to locate the relics, and allowed the Venetian ship to sail.

According to a later legend, the *passus* of the *translatio*, which originated during the first half of the 13th century, an incorporeal St. Mark awoke the sleeping sailors to warn them of dangerous shoals ahead during the voyage bearing his relics to Venice. The *passus* legend, like the dream-vision legend, was considered further proof of *praedestinatio*. Since St. Mark himself was a participant in the safe transportation of his relics, it was believed to be clearly predestined by God that St. Mark's relics should find their way to Venice. The merchants, however, still fearing governmental punishment for having broken the city's trade embargo, sent a messenger ahead with the news of their sacred cargo. When the herald received the Doge's promise of exoneration, the ship sailed into Venice, and the city celebrated its newly won possession of the relics (Demus, 1984, vol. I: 65-66).

St. Mark's *translatio* legend, which originated in and for Venice, is an extremely common theme in Venetian art (e.g., the figs. on pp. 45, 50, 52, 56, 72, 75, and 77), while elsewhere it was unknown, unaccepted or unpopular. The narrative of the *translatio* of St. Mark contains numerous episodes worthy of illustration. Almost every scene which included ships was repeated frequently in Venetian art; the land-based episodes were often omitted in favor of the more popular maritime scenes. The *translatio* narrative is an essential aspect of Venetian iconography, "an integral part of the ideological foundation of the Venetian Church and State (Demus, 1984, vol. I: 71)" for two reasons. First, since Mark came from Aquileia when he founded the patriarchate in Venice, Aquileia actually had prior claim to the patriarchal seat claimed by Venice. Initially the *translatio* legend was perpetuated to underscore Venice's claim to ecclesiastic primacy over Aquileia (Demus, 1984, vol. II: 188). Once Venice and Aquileia had united, this was no longer necessary, but *translatio* cycles continued to be popular themes nonetheless, since they asserted the divine right of Venice to possession of the relics. In relating the full story of the acquisition, transportation, and reception of the relics of St. Mark, the iconographic program aimed "to remove any doubts as to the reality and the completeness of the *translatio* (Demus, 1984, vol. I: 71)," and rationalized the appropriation of the saint's relics (Demus, 1984, vol. II: 187), thus encouraging local and international veneration of the saint.

Another saint important in Venetian art is St. Isidore, a Christian soldier of the 3rd century from Alexandria, Egypt. He

traveled to Chios with a companion named Amenion. At Chios, St. Isidore was tortured and beheaded in 251. According to legend, the *translatio* of the relics of St. Isidore from Chios to the Church of San Marco in Venice occurred under the leadership of Doge Michiel and the priest Cerbanus on April 16, 1125. Subsequently St. Isidore became the patron saint of the School of Carpenters of the Venetian Arsenal (Kaftal, 1978: 429). They funded the renovation of San Marco's St. Isidore chapel in the 14th century, where the *vita* and *translatio* of St. Isidore are the predominant cycles depicted (the figs. on pp. 79, 81, and 83).

Living in the late 4th or 5th century, St. Ursula was a princess of Brittany. Before her impending arranged marriage to Aetherius, the son of the pagan King of England, St. Ursula made a pilgrimage to Rome with 11,000 virgins. On her return, she was martyred at Cologne by the Huns (Kaftal, 1978: 1012-1030). Scenes from the *vita* of St. Ursula first appear in Venetian art beginning in the mid-14th century, occurring in panel paintings and manuscript illuminations. St. Ursula cycles became especially popular after the mid-15th century, when 100 Latin copies of her legend had circulated Europe, inspiring increased devotion to the saint throughout Europe, including Venice (e.g., the figs. on pp. 171, 175, 177, 178, and 180).

A final saint of some importance in Venetian art is St. Clement. This disciple of St. Peter and companion to SS. Cletus and Lunus was martyred on the Chersonese in the 1st century. He was thrown from a small boat with an anchor tied to his neck and drowned (Kaftal, 1978: 233). The figure of St. Clement is depicted in various mosaics and frescoes in Italy, including in San Marco; however, the depiction of his martyrdom is not found in monumental Venetian art, but only in a manuscript illumination of the 14th century (the fig. on p. 118).

Historical events that sometimes contain ship images were also recurrent themes in Venetian art. For example, Aquileia Cathedral's floor mosaics of peaceful fishing and hunting scenes (the figs. on pp. 30-32) symbolically allude to the triumph and peace achieved by the Edict of Milan (Muraro and Grabar, 1963: 12). Reports of the Crusades and handbooks for Crusaders also illustrate naval scenes, and some of these sources depict Venetian Crusader ships (the figs. on pp. 102, 103, 105, and 124). Various naval battles were recorded by artists, particularly those glorifying the power of Venice, and became common themes especially in paintings and manuscript illuminations from the 15th century on.

A few miscellaneous themes for which there is no historical or symbolic explanation also incorporate ship images. These include simple

fishing and boating scenes, illustrations of ports and harbors, boat-building craftsmen, and illustrated maps.

**Factors Affecting Availability and Type of Ship or Boat Depictions**

In comparison with other themes, maritime ones are relatively infrequent in medieval art. Not surprisingly, however, they are far more common in Venice than in landlocked cities. The choice of themes must primarily have depended upon the preferences of the artist's patron. The dominant patron of Byzantine art was certainly the Church. Thus, maritime images that do occur are those necessary to certain hagiographical legends and biblical stories. In Venice, these stories are repeatedly depicted, particularly the Marcan legends. In fact, certain episodes of the Marcan legend were more prominently displayed than others, depending on their perceived importance to the city: The *vita* of Saint Mark is depicted only once in mosaics of San Marco, in the relatively inconspicuous position of the Vestibule. In contrast, the more politically-charged *translatio* is portrayed at least three times in the mosaics of the Cathedral alone, and in positions of the greatest possible visibility: on the facade, in the antivestibule (which is now the enclosed Zen Chapel - it faces the sea and quay and originally served as one of the main entrances to the church), and in San Clemente Chapel, adjacent to the altar (Demus, 1988: 179). In later Venetian art, politics became an increasingly significant factor in the choice of themes, and their frequency and prominence.

Other factors essential to consider are the skill of the artist, and the fact that early Venetian art was strongly influenced by Byzantine conventions. Byzantine art is highly conservative. In Byzantine iconography, earlier themes are repeated, reproducing earlier designs. This repetition makes it likely that the depiction of any particular ship or boat is influenced less by contemporary ship design than by convention established based on an earlier ship type. Also, the most utilized media in the early medieval period of Venice, sculpture, mosaic and miniatures, permit little exact detail. Fortunately for this study, although Venetian art is strongly affected by the Byzantine style, it is often more realistic and incorporates a far greater range of designs (Demus, 1984, vol. I: 70).

A final, but highly significant factor to consider is the effect of deterioration and restoration. Venice has been victim to numerous fires and wars throughout her history. Her churches have been continually rebuilt and restored. It is impossible to know how many and what type of ship depictions have been moved abroad, kept in private

collections, or lost from the artistic record because of pillaging, destruction or renovation. For example, of the five original 13th-century ship frescoes on the medieval facade of San Marco, only one remains, reconstructed in a Baroque composition. The previous facade was fortuitously recorded in a 15th-century painting by the artist Bellini (the fig. on p. 72) and in the written records of the historian Stringa. Had the records of Bellini and Stringa not been preserved, segments of the important Marcan cycle decorating the facade of San Marco would not be known to us. There is no doubt that countless medieval Venetian ship and boat representations have been lost or destroyed. Nevertheless, nearly 100 ship or boat images dating before 1450 comprise this survey alone, and more certainly remain to be located.

# CHAPTER III

## CATALOG: MARITIME IMAGES IN VENICE

This chapter systematically describes the nautical features recognizable in each example of the collected sample, and provides a brief analysis of the ship or boat represented. The catalog is limited to material primarily gathered from Venice, with a few images from other cities of the Veneto, particularly Aquileia and Ravenna. The resultant sample indicates the wide range of ship and boat types used by Venetians, and provides invaluable pictorial details of those watercraft. An artist portrays ships in a certain way depending upon his chosen medium and its limitations, and also upon the period in which he is working. The catalog has therefore been arranged according to media (mosaics, enamels, manuscript illuminations, technical treatises, frescoes, paintings, and sculptures), and chronologically within each medium. Similar images from a common cycle are grouped together in the catalog. When necessary, all versions of the maritime image are illustrated, and the common aspects of the vessel depicted will be discussed first, while any unique features are subsequently discussed.

The relevant data and nautical features of each ship or boat image will be discussed in the following sequence:

- General information:
  - title, theme, artist, location, medium, date, general ship or boat type, angle of view depicted.
- Remarks on composition and any relevant effects of restoration.
- Description of nautical features:
  - rig: masts (number, position, inclination, relative heights), spars, sail (square or lateen, furled or set position), mast lashings, crow's-nest, rigging[10] (shrouds/stays, parrels, robands, halyard, vang, tack, tackles).
  - hull construction: basic shape, rockered or straight keel, stem and stern (relative height, termination, existence of castles), strakes (run of hull planking, any indication of bends, scarfs, joins or nails), any visible tops of frames, sheer line, wales, protruding beams.
  - steering apparatus: placement of rudders or steering oars, mounting, loom and blade shape (balanced or unbalanced).

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[10] Due to the nature of artwork, it is quite difficult to distinguish between various rigging, especially shrouds, stays, and halyards. Often the artist has defined the standing rigging too generally to be able to make distinctions among them.

- anchors (location, orientation, shape, fixed or unfixed stock).
- armament.

Technical terminology used throughout the thesis is based on Steel's elements of mastmaking, sailmaking and rigging (Gill, 1982), The visual encyclopedia of nautical terms under sail (Bathe, 1978), Steffy (personal communication, and class handout from Ship Reconstruction, spring, 1986), and, for the medieval Italian vocabulary, as discussed by Pryor (1984), and Bonino (1991, personal communication). Appendix I is the glossary.

Appendix II lists museums, libraries and churches visited in Venice, and Venetian church sites that were impossible to visit because permanently closed, privately owned, or under restoration. The plan of the Cathedral of San Marco (Figure 1) indicates locations within San Marco where 13 ship or boat mosaics are set (the figs. on pp. 45, 50, 52, 56, 58, 60, 62, 72, 75, 77, 79, 81, and 83), and where ship graffiti exists. Unless otherwise indicated, the dates given for the San Marco mosaics are the dates accepted by the Procuratore di San Marco (the administration of the Church of San Marco. Personal communication with Dr. Maria Urbani, Procuratore di San Marco, February 6, 1989), as well as most art historians.

## Mosaics and Enamels

Figure 2, Figure 3, Figure 4

| | |
|---|---|
| Theme: | Figure 2 Line fishing scene.<br>Figure 3 Net fishing scene (left) and duck hunting scene (right).<br>Figure 4 Jonah and the Whale. |
| Location: | Floor mosaic, near epigraph of Bishop Theodore, Basilica di Poppo, Aquileia. |
| Date: | Beginning of 4th century (Göttlicher, 1985: 127). |
| General types: | Four fishing boats (Type Ic). |
| Views: | Figure 2 Port side, viewed slightly from stern.<br>Figure 3, Figure 4 Starboard profiles. |

This floor mosaic portrays four small fishing boats upon an ocean teaming with sea life. Figure 2 illustrates line fishing. Figure 3 shows two fishermen net fishing from the stern of the boat to the left, and in another vessel nearby to the right, men are engaged in a duck hunt. Figure 4 depicts Jonah and the whale: one man casts Jonah into the mouth of the whale, and a clothed, saintly figure stands in an orant pose at the stern. All examples have a rounded hull, are fuller at stern than bow, and have relatively straight sheer strakes. The vessel in Figure 2, a Roman boat type known as the *horeia* (Casson, 1971 B: fig. 137, #20), has a full rounded bow, with an inward curving head of its

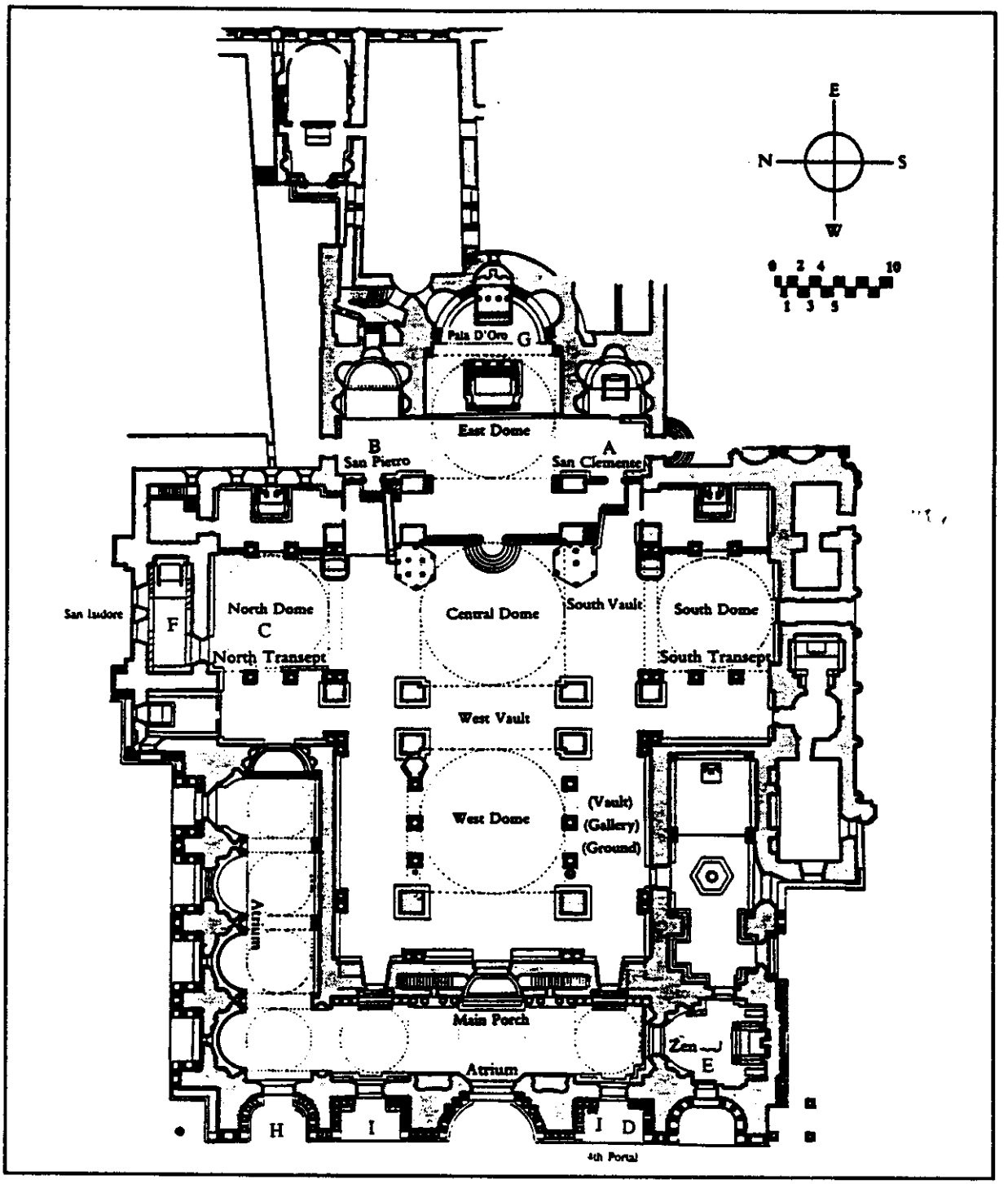



**Figure 1** Plan of San Marco (Demus, 1984: 389).

Mosaics including nautical scenes are located in A) San Clemente chapel, B) San Pietro chapel, C) the north transept, D) the fourth portal, E) Zen chapel, and F) San Isidore chapel. G) The *Pala d'Oro* is located at the altar. H, I, and J) mark the portal locations of columns with ship graffiti.

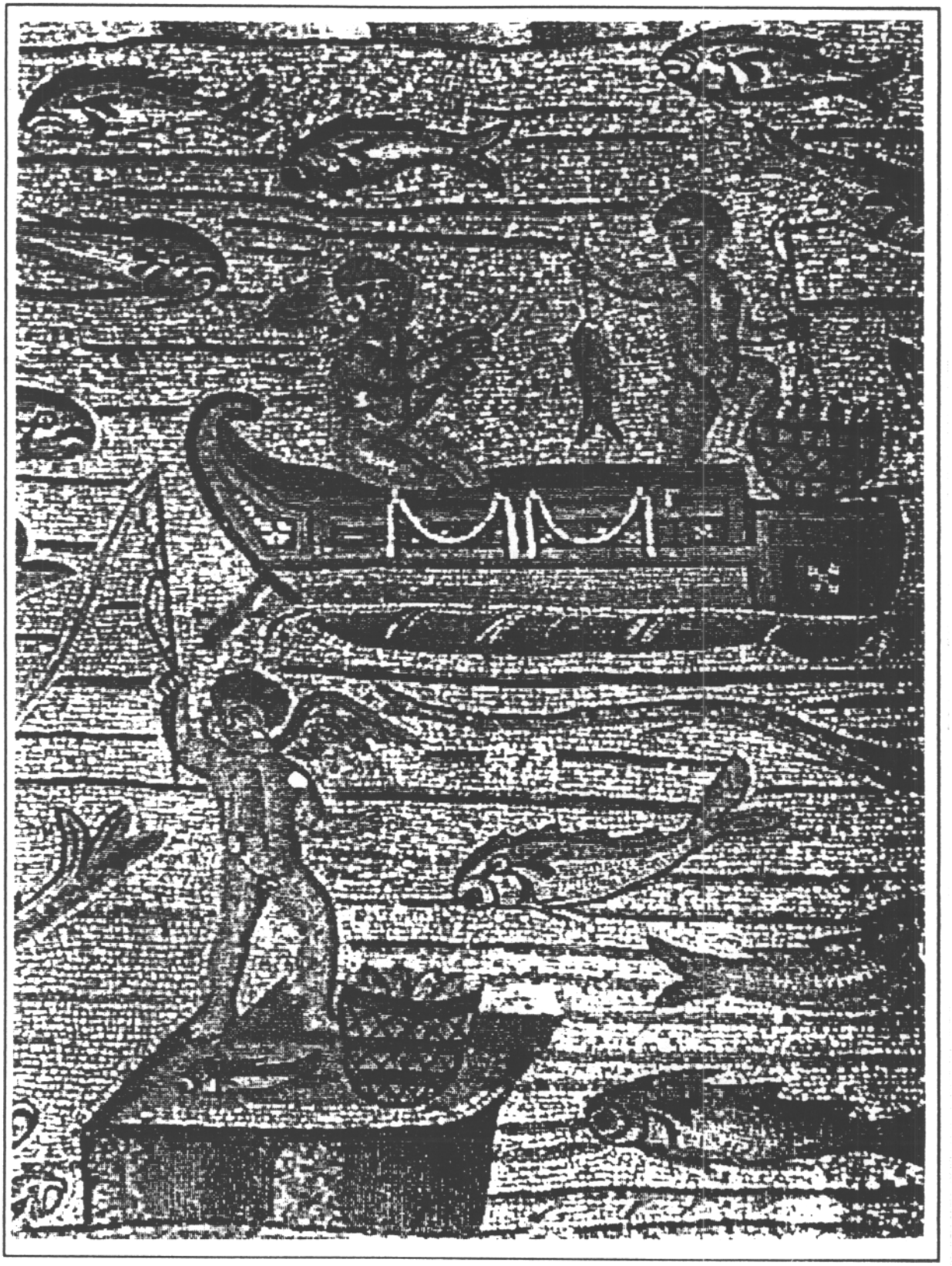


**Figure 2** Line fishing scene, floor mosaic in Aquileia Cathedral, beginning of 4th century.

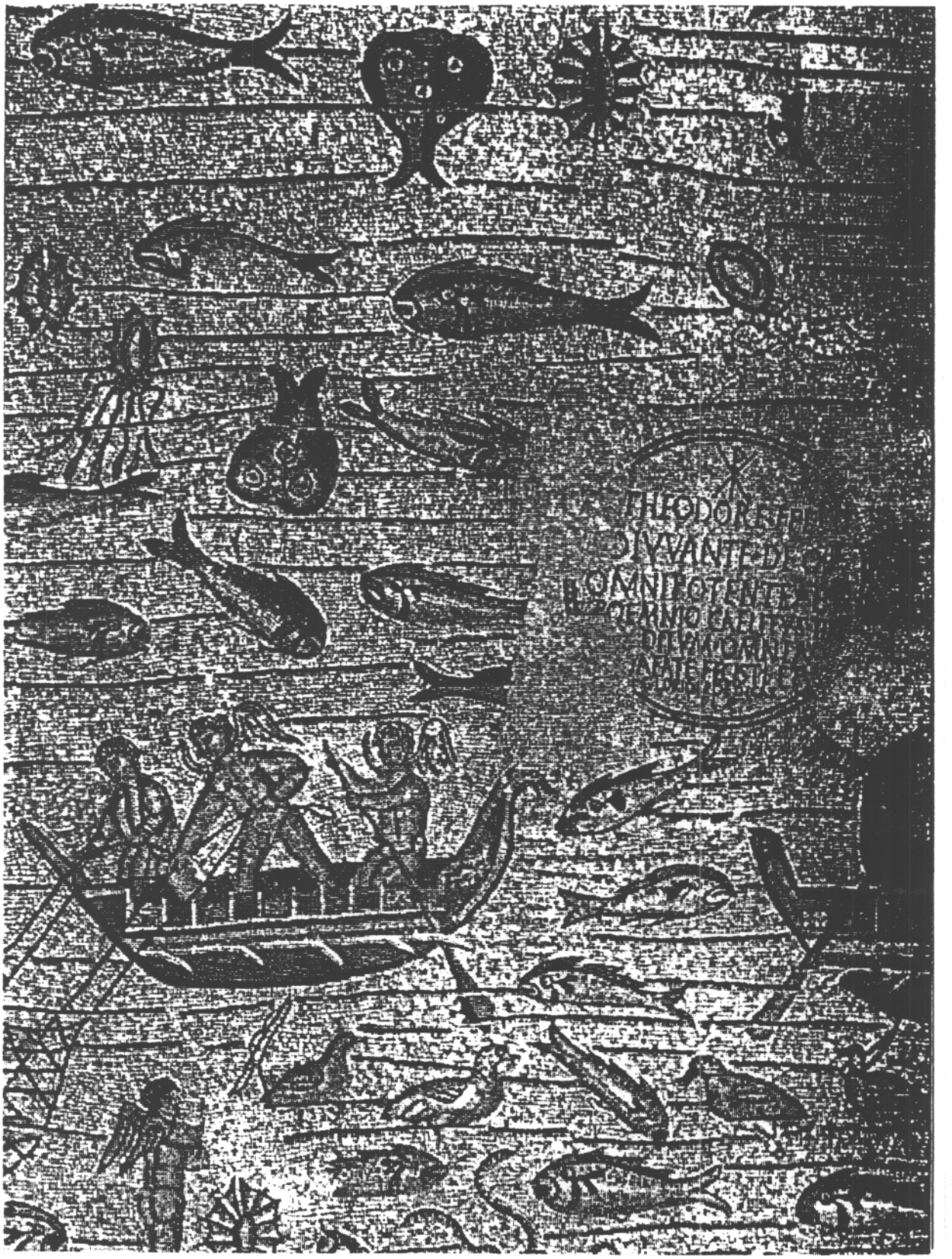


**Figure 3** Net fishing scene (left) and duck hunting scene (right), floor mosaic in Aquileia Cathedral, beginning of 4th century.



**Figure 4** Jonah and the Whale, floor mosaic in Aquileia Cathedral, beginning of 4th century.

stem, but a nearly flat-sloped stern, which provided a spacious open area aft. The other craft are double-ended. The boats in Figure 3 (left) and Figure 4 have a slightly outward curving stem which ends in a bird's head finial (cf. Throckmorton, 1972: fig. 2), but their sternposts are straight. In all four cases, one symmetrical-bladed oar, with no visible oarlock, is being employed by a nude figure at the bow.

Figure 5

| | |
|---|---|
| Theme: | The Calling of the Apostles Peter and Andrew. |
| Location: | North clerestory panel, by entrance door, Sant'Apollinare Nuovo, Ravenna. |
| Date: | ca. 504-526 (Bovini, 1971: 77, and de la Croix and Tansey, 1980: 232). |
| General type: | Fishing boat (Type Ic). |
| View: | Starboard profile, slightly from above. |

This well-preserved mosaic depicts a small, double-ended fishing vessel. The inclination at the bow indicates to Bonino that it is probably flat bottomed, as shown in his reconstruction, Figure 6 (1978: 48). The stern ends in an inward-curving volute. Continuous rows of strakes, delineated in the mosaic with rows of white, green and black tesserae, converge at the posts. A wale is depicted with a red line. Three hefty beams extending above and through the uppermost strakes functioned as thwarts and deck supports, and provided lateral structural support. It is likely that the shell-first hull construction technique was employed to construct this vessel. Figure 6, Bonino's reconstructed version of Figure 5, shows the vessel with structural beams supporting half-decks at bow and stern (Bonino, 1978 A: 35 and 48). Figure 7, Bonino's reconstruction of another shell-first boat of the Roman period from northeast Italy (based on a 1st-century stele of P. Longidieno in the Museo Nazionale of Ravenna) reveals similar beams, which would have provided essential structural support for the hull; those at bow and stern also functioned as a support for a small deck at each end of the hull.

On the visible starboard side, one steering oar (or possibly a quarter rudder) is depicted in the mosaic. It is attached slightly aft of midships through a thole bight hung on a thole pin. This steering oar consists of a rectangular, symmetrical blade attached to a round loom. Bonino has reconstructed the craft with two steering oars mounted astern, and two more freely employed abaft.



**Figure 5** The Calling of Peter and Andrew, panel mosaic in north clerestory (ca. 504-526), Sant'Apollinare Nuovo, Ravenna.

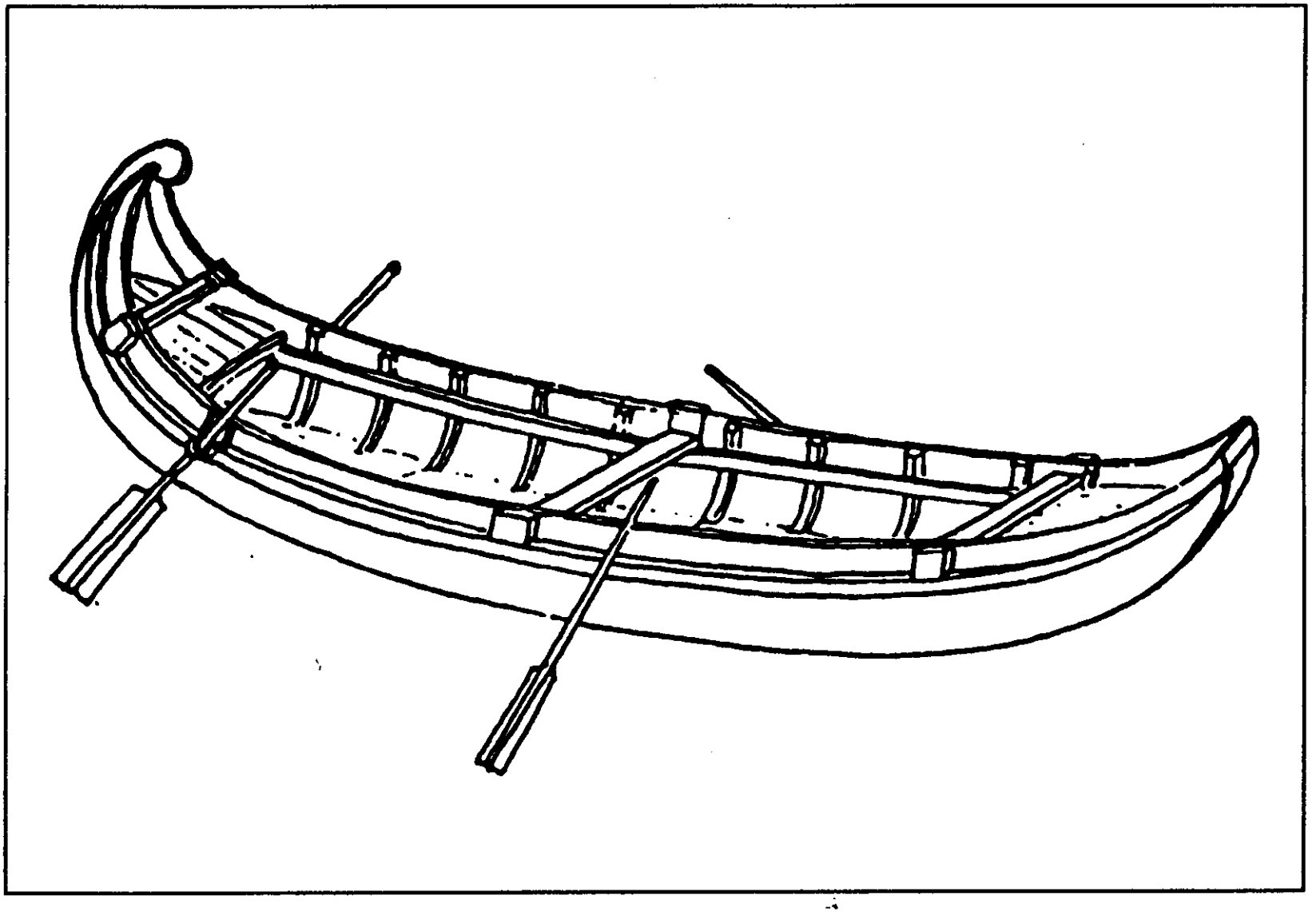


**Figure 6** Reconstruction of Figure 5, a 6th century fishing boat, from the mosaic at Sant'Apollinare Nuovo (Bonino, 1978 A: fig. 10 B).

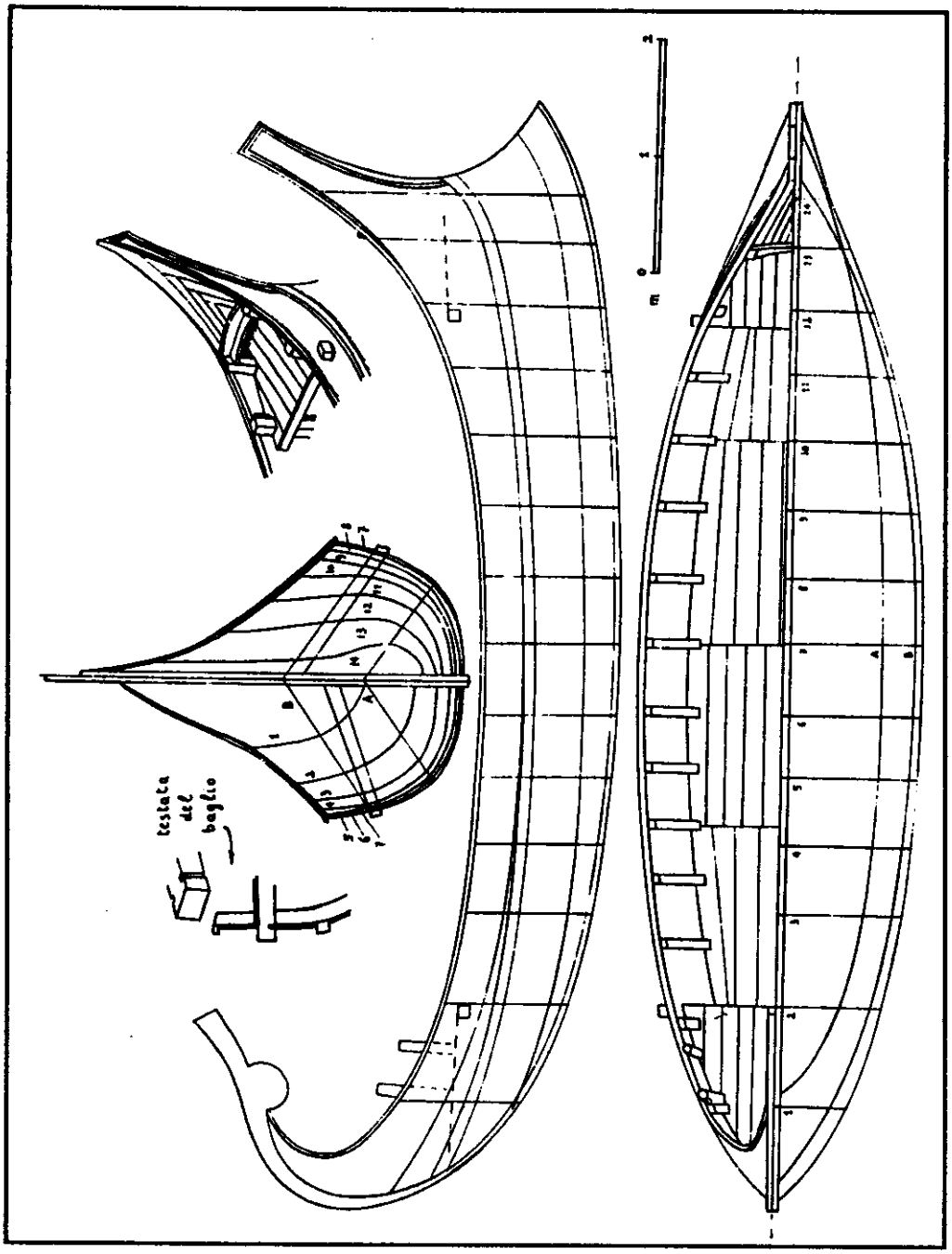



**Figure 7** Reconstruction of the Roman boat represented in the 1st-century stele relief of P. Longidieno (Bonino, 1978: fig. 5).

Figure 8 A, Figure 8 B, and Figure 8 C

| | |
|---|---|
| Theme: | Port of Classe. |
| Location: | North wall, upper left, near entrance to nave, Sant'Apollinare Nuovo, Ravenna. |
| Date: | ca. 504-526 (Bovini, 1971: 77, and de la Croix and Tansey, 1980: 229). |
| General types: | Three river or coastal cargo vessels (Type Ie). |
| Views: | Starboard profiles. |

This mosaic of Ravenna's port city was somewhat altered after 561, and poorly restored in 1855 by Kibel; the area at the top of the mast of A, the uppermost vessel, is known to be in error (Bonino, 1978 A: 48). The hulls of the bottom two vessels have been remade, although the original design is believed to be essentially unaltered (Bovini, 1966: 93 ff.).

From the date of this mosaic of the port of Classe, and the depiction of only one mast, it can be assumed that the vessels depicted are relatively small vessels intended for the local riverine and coastal trade. In all three vessels, a single, vertical mast set amidships is supported with two forestays and two backstays. The sails of the middle and lower vessels, B and C, are not shown, but the sail of A is set, with its lower ends tied off, and with tack and sheet leading forward and aft.

Rather than the usual series of vertical lines recognizable in most depictions (e.g., the figures on pp. 50, 64, and 81), the sail is represented as a series of rectangles, some incomplete, where the sail apparently is curled over. By depicting these rectangles, the artist probably intended to imply an overall square rather than triangular shape for the sail, although no corroborating evidence, such as brailing lines, is apparent. The sail portrayed is neither clearly square nor triangular in shape, and it is impossible to tell from the sail alone whether these vessels are meant to be square or lateen-rigged. Other characteristics of the vessels are even more enigmatic. The placement and vertical orientation of the single masts amidships, and the presence of forestays, are evidence for square sails. Two other characteristics, however, are more indicative of a lateen rig. Before this mosaic was inaccurately restored by Kibel, the cross at the top of the mast had been inclined forward. A forward inclination of any projections at the top of the mast is a common characteristic of lateen-rigged ships, since in tacking, the sail and yard have to be able to pass in front of the mast (see discussion of the lateen rig, p. 209). A vertical element projecting at the top of the mast would therefore impede a lateener's tacking maneuvers, while a forward slant of the mast and any existing projections would facilitate such maneuvers (Bonino, 1978 A: 48).



Figure 8 The port of Classe, with three river or seagoing cargo boats. A) upper vessel; B) middle vessel; C) lower vessel. Nave wall mosaic (ca. 504-526), Sant'Apollinare Nuovo, Ravenna.

Another feature more characteristic of a lateener than a square-rigged vessel is that the sail appears to be set abaft the mast and external to the stays, a position only feasible on a lateener. Bonino has reconstructed the vessel as square-rigged (Figure 9), and proposes a waterline length of 27 meters (1991: 35).

In all three vessels the sternposts are slightly higher than the stems; both posts curve inward at their upper ends. A slightly rockered keel running parallel to the sheer strake seems delineated by a line approximately equal in thickness to the other strakes. In A, four black lines athwartships (aft and slightly forward of the mast) indicate two transverse beams just beneath the level of the sheer strake, providing lateral structural support. Bonino has interpreted the series of squares set parallel and below the sheer strake in B as a balustrade or outrigger structure (1978 A: 48; see Figure 9, bottom).

The attachments for the starboard quarter rudders are most clear in A and C; they are secured through a Roman box mount. Two closely-spaced through beams discovered on the 7th-century Byzantine ship wrecked at Yassi Ada are thought to have provided the structural beams to form, along with the hull side and an outer crosspiece, similar box-like mounts for the steering apparatus (van Doorninck, in Bass and van Doorninck, 1982: 52). The thin and rectangular quarter rudders are greatly simplified, and provide nothing but the most rudimentary information as to the shape and size of the rudders. Because of the balustrade or outrigger structure, the stern shape and sheer of B are distinct from the other two; no quarter rudders are shown, but one of the two apertures visible in the after end of the balustrade seems intended to serve as the mount for the quarter rudder.[11]

Figures 10, 11, 12, 13, and 14 will follow.

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[11] Bonino interprets this middle vessel as showing an important transition in the form of the side rudder support. He has reconstructed B with a very robust balustrade structure (see Figure 9, bottom), a simplified version of the *apostis* of Roman merchant ships, which were improved with the simple type of rudder yokes shown in A and C.

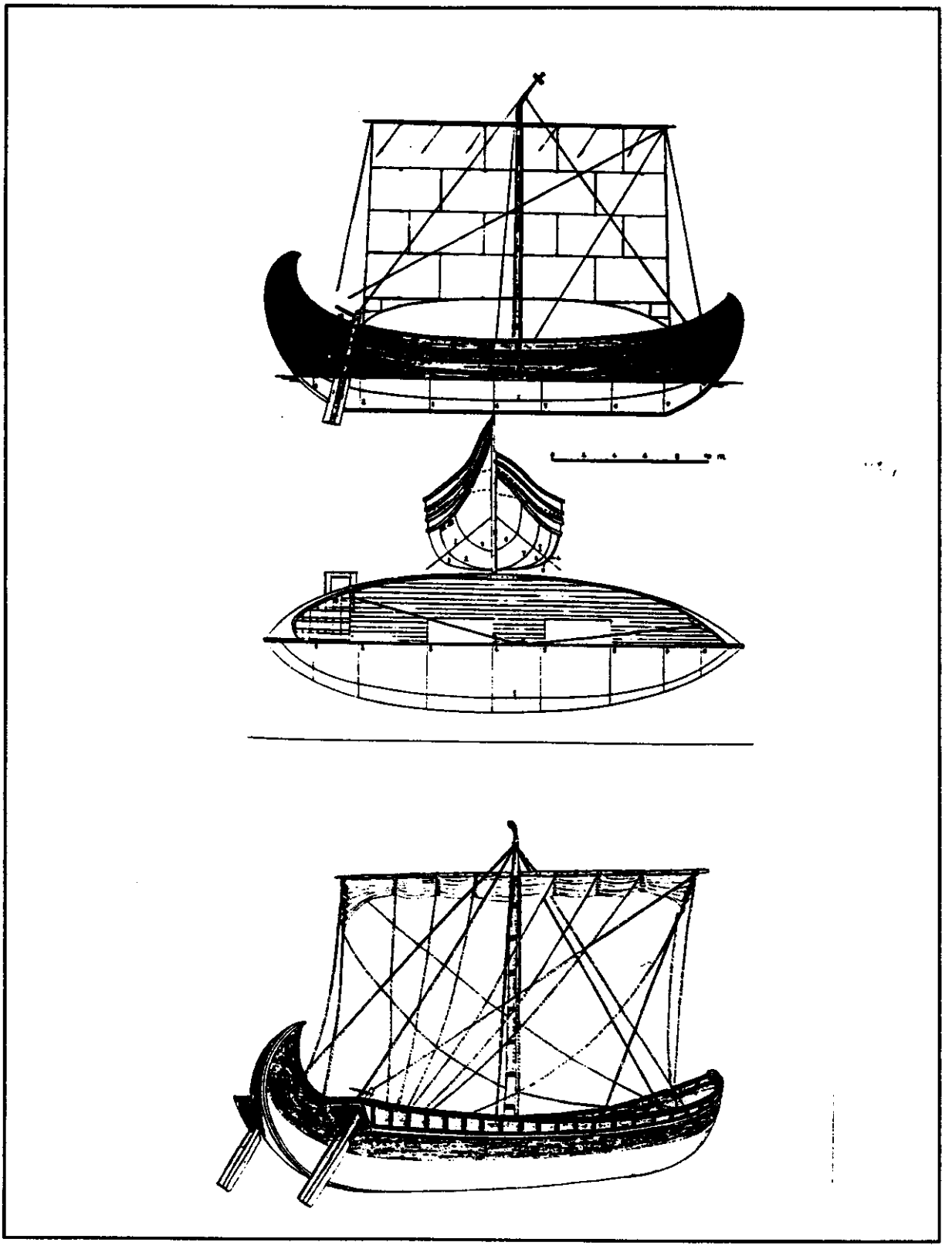


**Figure 9** Reconstruction of 6th-century river or seagoing cargo vessels in the Port of Classe mosaic (Bonino, 1991: fig. 6 and 7).

Figure 10, Figure 12, Figure 13, Figure 14

| | |
|---|---|
| Theme: | *Translatio* of St. Mark cycle:<br>1. Figure 10 - The Loading of the Relics in Alexandria (includes a round ship and a lighter).<br>2. Figure 12 - Departure from Alexandria.<br>3. Figure 13 - The *passus*: St. Mark Saves Ship from Shipwreck.<br>4. Figure 14 - Arrival at Venice. |
| Location: | East, south, south and west sides of vault, San Clemente Chapel, San Marco, Venice. |
| Date: | First half of 12th century. |
| General types: | Four versions of a large seagoing round ship (Type IIIc) and one lighter (Type Ib). |
| View: | Starboard profiles. |

San Clemente and San Pietro are symmetrically oriented chapels flanking the altar of San Marco (Figure 1 A and B). The mosaics of San Pietro depict acts from the life of St. Mark and St. Peter pertaining to the prehistory of the Venetian Church and her ecclesiastical domain. Those in San Clemente, the Doge's chapel directly across the altar (originally with access directly from the Doge's Palace), illustrate the Doge's influence on Venetian church life, such as his involvement in the *translatio*, the posthumous transportation of the relics of St. Mark (Demus, 1988: 28 and 96).

The Marcan *translatio* cycle decorating San Clemente, begins on the east half of the chapel's vault with the Loading of St. Mark's Relics onto a merchant vessel (Figure 10). The narration proceeds to the right, on the south wall and left of a circular window, with the Departure of the Vessel from Alexandria (Figure 12). The narration continues, not immediately to the right, on the other side of the circular window, but on the west half of the vault, with the Saving of the Ship by St. Mark (Figure 13). The final episode, the Arrival at Venice (Figure 14), is located on the south wall, to the right of the circular window.[12]

With a few differing details, all four ship depictions show the

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[12] The *titulii* of both ship mosaics of the south wall have been lost, and the one on the west half of the vault has been altered. This explains the discrepancies in the interpretation of their themes. According to Levi, for example (1892: Table 42, fig. 1), the ship mosaic in the west half of the vault (Figure 13) represents a scene from the *vita* of St. Mark, his voyage from Aquileia to Alexandria, while other sources have inaccurately identify this mosaic as St. Mark's dream, (Pataky and Marjai, 1973: 3) or St. Mark approaching Egypt (Casson, 1964: fig. 97). However, both Lorenzetti (1982: 208) and Demus (1984: 66) concur that all four mosaics depict the *translatio*. The *vita* scene of Mark traveling from Aquileia to Alexandria is depicted instead in the roughly contemporaneous mosaic of the vault in San Pietro chapel, a chapel across the altar from San Clemente chapel (Figure 15).

starboard side of an armed, three-masted, lateen-rigged round ship, with a small quarter-deck and two quarter rudders. These four ship mosaics, along with one in nearby San Pietro (Figure 15), provide a rare example of the after mast this early. More common in medieval depictions are two-masted lateeners. In fact, such a large, three-masted ship is not often portrayed anywhere in the Mediterranean over the entire period of this study (Pryor, 1984, no. 3: 284), and does not again occur in this sample (see distribution in graphs on pp. 241 and 250).

The mizzen and after masts are vertical, while the foremasts rake slightly forward at about 13 degrees, except for Figure 14, where the completely vertical foremast is probably the result of a poor restoration. As is common for multi-masted ships of the medieval Mediterranean, the foremast is taller than the other masts: This is so for all but the ship in Figure 10, where the mizzen mast is tallest. Restoration may be the cause of this inconsistency. According to Demus (1984, vol. I: 67), the face toward the top of this mizzen mast is of doubtful authenticity, and the mast's height seems likely to be in error as well. The after mast is in all cases the shortest mast. Shrouds and halyards are only generally depicted, and it is difficult to distinguish them. Four lines depicted fore and aft of the mast, running up to the tops of the masts and down again along the sides of the masts, are apparently meant to indicate the shrouds, both to port and starboard. Sometimes the halyard is defined.[13] In Figure 10 and Figure 14, furled sails are stored on their yards, parallel to deck level about halfway up the masts, and vang or tack lines have been used to secure each yard. Where the ship is shown under way, with sails set (Figure 12 and Figure 13), vang and tack lines are usually indicated by one or two lines each. The omission or inconsistency seen in Figure 12, where the vang and tack of the foremast sail are completely lacking, might be the result of deterioration or restoration work, or merely the carelessness or lack of knowledge on the part of the mosaicist. In these two representations, the sails look to be almost four-sided. That they are indeed lateen sails, however, is made clear by the way in which yards project further aft than forward of the masts on which they are set.

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[13] Without the use of perspective (the norm during the medieval period), it is difficult for the artist to indicate the side to side position of shroud lines when a ship is drawn in profile. In order to give the illusion that the lines run to port and starboard, these rigging lines were usually drawn fore and aft of the masts. This is apparent in Figure 14, a ship viewed from starboard profile. What remains of the tack runs behind the two lines drawn forward of the foremost mast. These two lines must thus be meant to indicate the starboard shrouds.

Robands binding the sails to the yards are clearly represented in the two ships with set sails.

The central placement of the crow's-nest at the top of the mast as portrayed in the ships of these mosaics as well as the adjacent Figure 15, may pose a logistical problem. The mast appears to pass up through the center of the floor of the crow's-nest, and to continue above the top of the basket. This could be problematic in that such a centrally placed crow's-nest and its upper extension at the head of the mast would hamper the tacking maneuver, since in tacking, the yard must be brought completely around the mast's forward side (see discussion on the lateen rig, p. 209).

A different interpretation of these semi-vertical features above the baskets of the crow's-nests may resolve this apparent difficulty. Best seen on the after mast of Figure 10, all masts of Figure 13, and the after and mizzen masts of Figure 14, the projection at the top of the crow's-nests is a curving line, thick at its base, but tapering to a point, as one might depict a flame. It is possible that removable lanterns were placed in the crow's-nests, and what appears to be semi-vertical continuations of the mast are in fact lantern flames.[14] If this is correct, the interpretation of this feature as a continuation of the mast posing a logistical nautical problem for a lateener would be minimized. The central position of the basket itself however would still seem to be an impractical arrangement for a lateener. Perhaps the basket was movable, or a mariner was posted there to help the yard over the basket. The crow's-nest is usually depicted as positioned aft of the mast, as, for example, in the figure on page 79. In light of the fact that the majority of lateeners in the catalog portray crow's-nests aft of the mast, I believe these baskets must have been either removable lanterns, or their placement as a crow's-nest was an error of the mosaicist or an inaccuracy introduced during early restorations. A centrally positioned crow's-nest is appropriate for a square-rigged ship, which would have been the type with which restorers of subsequent centuries were familiar.

Wherever not obstructed by sails or clothing (Figure 10, Figure 12, and Figure 14), the stem is shown as being slightly taller than the quarter-deck at the stern. Top-timbers serving as bitts are shown projecting above the sheer strake in all but Figure 13, where this area is concealed by the sail on the foremast. In Figure 10 and Figure 12, the top of three top-timbers employed as bitts are shown

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[14] I am indebted to Tom Oertling for suggesting this interpretation.

evenly spaced along the waist of the ship, and, in Figure 10, three more are visible, spaced slightly closer together in the bow. In Figure 14, four are shown at the waist of the ship, but none are evident in the bow. This seems to suggest fairly regular room-and-space along the midsection of the ship, with more closely spaced frames toward the bow. In these mosaics various lines can be seen tied off to most of the visible bitts.

The rudders of Figure 10 alone are of the foil design, while those represented in Figure 12, Figure 13, and Figure 14 are of the balanced type of quarter rudder and have an elliptical shape (see figure of rudder types, p. 262).

According to Demus (1984, vol. I: 71), because of the desire to make a convincing statement concerning the acquisition of St. Mark's relics, these ships of the San Clemente cycle were rendered with an objective realism uncommon in medieval art. Another logical reason for emphasizing maritime scenes with such accuracy is the importance of seafaring to Venetian existence. All Venetians were familiar with ships and boats, and would easily recognize any errors or inaccuracies.

Figure 10

| | |
|---|---|
| Theme: | *Translatio* of St. Mark: The Loading of the Relics in Alexandria; The Ship is Examined by Muslims.[15] |
| Location: | East half of vault, lower register, San Clemente Chapel, San Marco, Venice. |
| General types: | Large round ship (Type IIIc) and lighter (Type Ib). |

This mosaic has been badly restored. Although its composition is believed to be fairly accurate, almost no part of the mosaic is original, including most of the ship, as the gold background was completely replaced in the 1880's (Demus, 1984, vol. I: 67 and note 73). Features of the ship represented must therefore be considered with due caution.

The scene in Figure 10 shows the vessel from starboard, moored in port at Alexandria with two sails furled and another sail being used to disguise the relics of St. Mark. The mizzen mast is set slightly aft of midships, the foremast and after mast are set respectively quite far forward and aft, raking forward at about 8 and 4 degrees. Each of the three crow's-nests (or mast lanterns) has been depicted as a series of small squares. The foremast and after mast examples consist of four squares while the mizzen mast is six. The face of a man can be discerned just beneath the head of the mizzen mast, which, as mentioned

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[15] *Titulus: CARNIBVS ABSCONSVM QVERVNT FVGIVNTQVE RETRORSVM.*

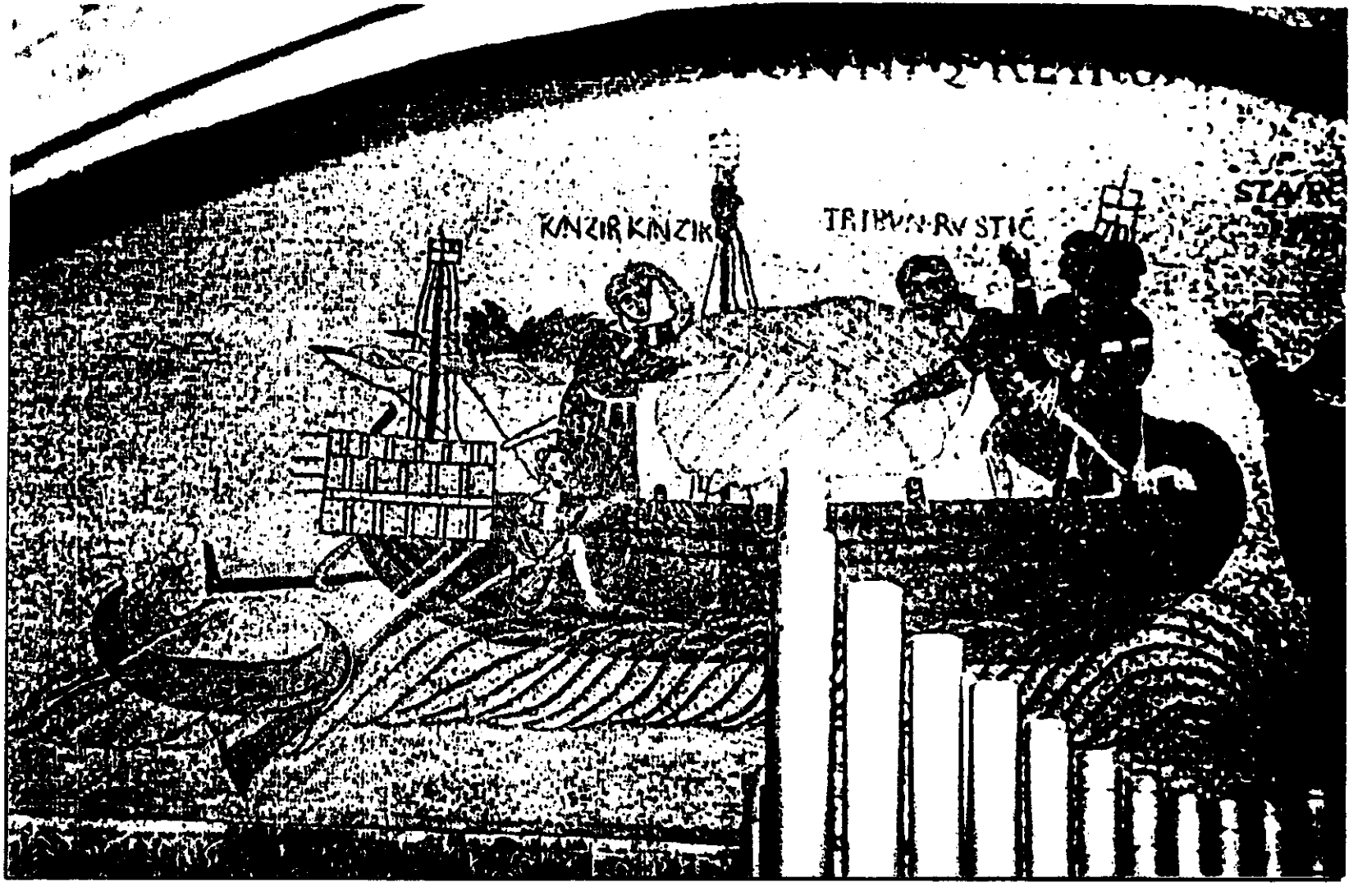



**Figure 10** *Translatio* of St. Mark: The Loading of the Relics in Alexandria, east vault mosaic dating to the first half of the 12th-century, San Clemente Chapel, San Marco.

above, is probably not original (Demus, 1984, vol. I: 67). The vangs or tacks of the two furled sails have been utilized to secure their yards.

Four parallel lines extending from the underside of the quarter-deck forward to the bow seem to represent in profile a slightly rockered keel and bottom hull planking, and the stem at the bow. The upper most part of the stem, roughly equal in height to a post projecting inboard above the quarter-deck, curves back dramatically at almost 90 degrees, so that its end, which flares out on both sides, faces directly aft.[16] The rectangular quarter-deck, which begins just above the top of the aperture for the quarter rudder, extends aft beyond the hull proper. This sterncastle consists of three levels of rectangles. Another four parallel lines extending from the forward side of the quarter-deck to the stem, represent the sheer strake and a few upper rows of hull planking. Thus, the uppermost three rows of strakes and several running along the keel have been specifically delineated, while the intermediate hull planking has been left plain and undefined.

At the after end of the intermediate undefined hull area on the visible starboard side there is a circular aperture through which the loom of the starboard quarter rudder passes. Both quarter rudders are supported additionally by black and white ropes. The placement of the aperture for the starboard rudder and the rudder's orientation relative to the ship's side give an idea of the shape of the hull at this point; in order for the rudder to enter the water from this aperture, the hull must have narrowed considerably beneath the aperture.

Both rudder blades are asymmetrical, indicating that they are unbalanced rudders (a similar rudder type is depicted in a 12-13th century mosaic of St. Phocas in the atrium of San Marco [Kaftal, 1978: fig. 1158]). Their foil design reflects the great improvement made on rudder design during the medieval period. Positioning the major part of the blade aft of the shaft increases the rudder's force while decreasing its drag (Mott, 1991: 41). The starboard *temone*, or quarter rudder blade, appears to be hung in the wrong direction; whenever the ship is under way, the side of the blade which flares out should be "downstream," while the straight side of the blade belongs on the "upstream" side, as seen in the port rudder. The ship is in port, however, and not under sail: the rudder blade may be raised in this position in a normal procedure for mooring. Rudder blades were able to

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[16] Small fishing boats depicted in the Miraculous Draught of Fishes and larger ships in the depiction of Noah's ark (late 12th-century mosaics in the Cathedral of Monreale, Sicily; Moll, 1929: figs. 123, 124, and 125 ) have similar stem and stern posts.

rotate freely. This is clear from a passage where "Geoffrey of Vinsauf tells us that when Richard the Lion Heart's galleys encountered a large Saracen ship off the coast of Palestine, one of the tactics used to overcome its resistance was for men to dive overboard and lash the steering oars in a turning position with ropes so that it could not escape (Pryor, 1984, no. 3: 280)." Since the port quarter rudder is raised, the far side of the ship is most likely at the quay side.

Two sets of red lines in approximately the same "V" arrangement can be seen below the aperture for the starboard rudder, and, outboard, running from the forward upper corner of the quarter-deck upward and behind a human figure. These lines probably represent the rudder hoists, which were attached to the leading edge of the rudder blade and used to raise the rudders (Mott, 1991: fig. 6.30 E); the port rudder, however, shows a redundant system; the black and white rope is another rudder hoist type which simply looped around the lower end of the blade (cf. Mott, 1991: fig. 6.30 A).

In this loading scene, four poles project horizontally from the quarter-deck (detail, Figure 11 A). Each has uniquely shaped tips, comparable to those seen in Figure 13 and Figure 15 (details, Figure 11). The tip shapes include a hook, a triangular arrow point, a prong-like form and irregular pointed shapes. The hook may have been used to cut the lines of enemies' rigging, while the other shapes perhaps were specialized for other distinct military purposes. The pointed implements are likely to be iron-tipped weapons, such as hand-thrown javelins, pikes or the quarrels launched with a crossbow. Zeno's code of 1250 required that each crew member carry *balistam de cornu cum centum quadrellis habeat* (Predelli and Sacerdoti, 1903: 96, code XXVII) that is, a crossbow with 100 bolts. According to Rubin de Cervin (1985: 18), the simplest crossbows were called either *a crocio* (cross-type) or *a gancio* (hook type), and launched short bolts with triangular iron tips, such as those seen in Figure 11 B and Figure 11 C. Written documents of the medieval period mention an area projecting four or five feet abaft the poop of large merchant ships (called *bellatorium* in Latin, and *ballador* or *ballaor* in Venetian [Nebbia, 1932: 32]), used as a war or fighting platform (Pryor, 1984, no. 3: 279 and fig. 9; Laughton, 1956: 278). These rare depictions of weaponry may confirm the existence of this fighting area at the stern of some early Venetian armed merchant round ships. It may be, however, that these should be interpreted as pole arms and not weaponry. Figure 11 D, a ship in a 15th-century French miniature of the Bibliothèque Nationale (Bibl. nat.

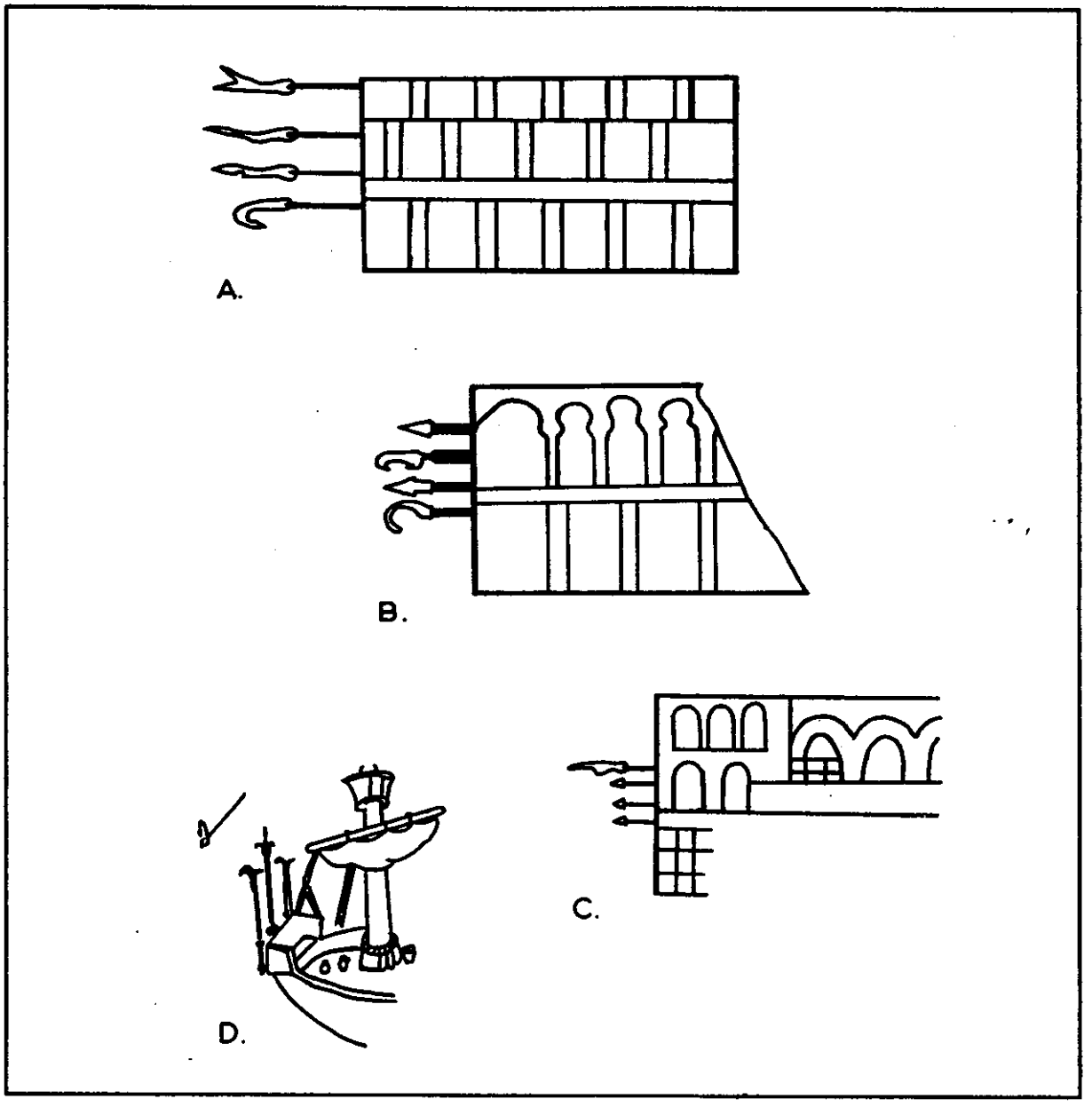



**Figure 11** Projecting poles from quarter-decks: weaponry of the *bellatorium*, or pole arms.

A) Detail of Figure 10. B) Detail of Figure 13. C) Detail of Figure 15. D) Detail of ship from a 15th-century French manuscript, after Villain-Gandossi (1979: fig. 12.9).

Paris, ms. lat. 7239, f° 61v°, "*tractatus de re militari et de machinis bellicis*"), has three similar poles with tips seemingly adapted for use as pole arms; Here the poles are stored vertically at the stern. Note the flaming javelin mid-air; these implements may in fact be weaponry.

A painter ties a small service boat astern. The lowermost line of this boat depiction probably represents its rockered keel. Another forms a lively sheer curving upwards to a point at stem and stern. A final line, incomplete or intentionally broken, suggests either a small wale or a row of planking. A steering oar or quarter rudder held by the mariner at the stern is indistinctly depicted.

Figure 12

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|---|---|
| Theme: | *Translatio* of St. Mark: Departure of Vessel from Alexandria. |
| Location: | South wall, lower register, left of window, San Clemente Chapel, San Marco, Venice. |
| General type: | Large round ship (Type IIIc). |

Figure 12, the second of the San Clemente *translatio* cycle, shows the vessel preparing to sail. Most of this mosaic was reset during the Renaissance; according to Demus, in most areas the restoration seems to be fairly accurate, although the *titulus* was lost. Since they are not included in any of the other ship depictions of this cycle, the unusual decorative arcades under the *bellatorium* (obstructed from view by organ pipes in Figure 12, but visible in Levi, 1892: Table 42, fig. 2) and the cross on the sail seen in this version alone seem likely due to this restoration (Demus, 1984, I: 65-67). Several centuries later, round ships exhibit such decorative arches around the quarter-deck (cf. the fig. on p. 124, and Kaftal 1978: fig. 613).

Two of the three lateen sails have been set. The after mast's sail is already raised, and the foresail has just been hoisted by a mariner who still has one hand by the halyards. Regularly spaced vertical lines portrayed on each sail indicate seams in the sail cloth. The sails are shown attached to their yards with robands at the end of each vertical "seam" line. Vang and tack lines to control the heel and peak of the sails are shown on the after mast sail only. In all likelihood, these rigging details on the foresail were lost during the course of restoration. The foresail is decorated with a red cross. The crow's-nests of this ship are consistently depicted with lines forming four simple squares.

A slightly rockered keel seems represented with one line. Of the side hull planking, only the top three strakes have been defined: four lines run parallel from the bow, but converge and terminate at the

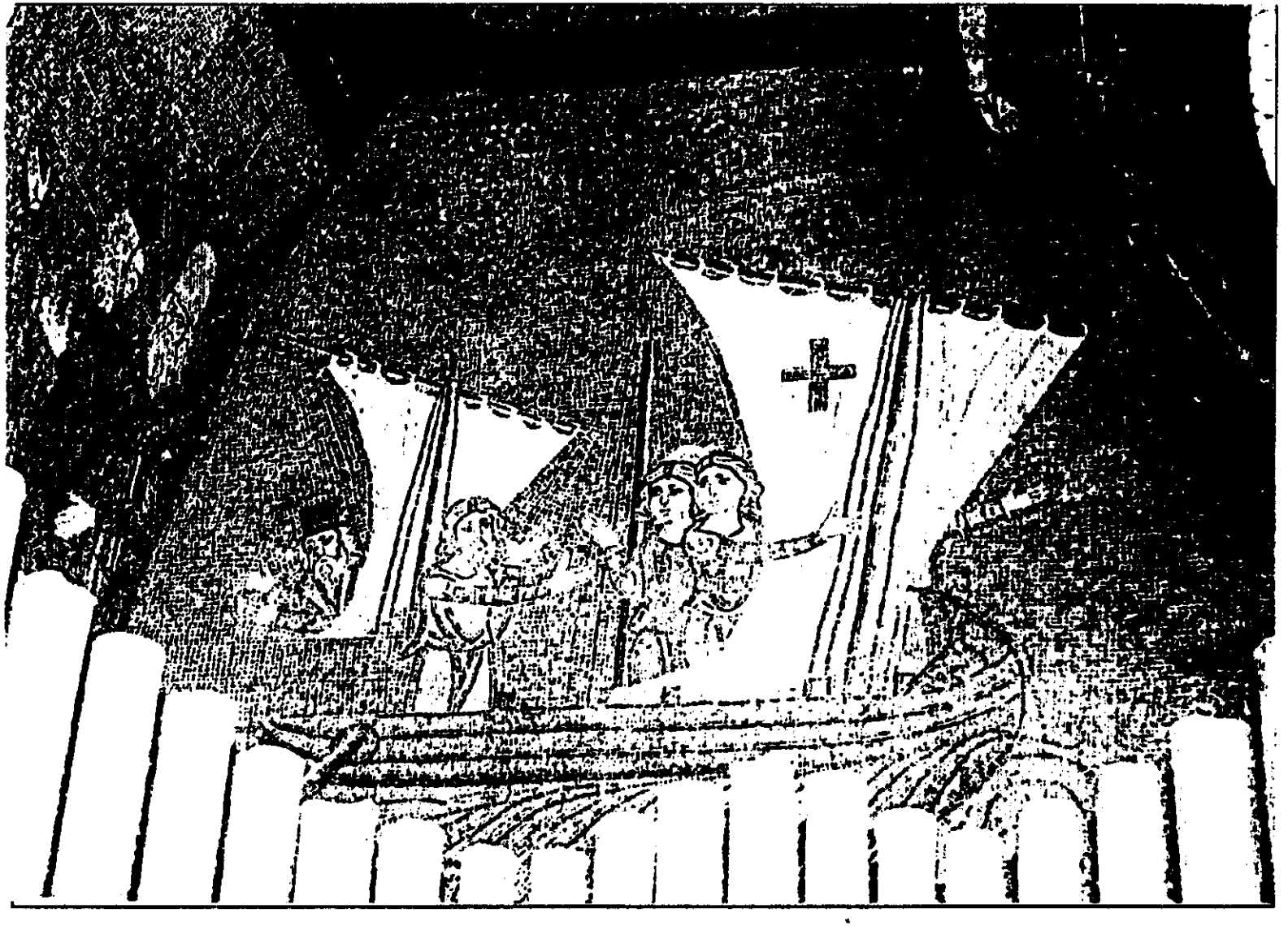


**Figure 12** *Translatio* of St. Mark: Departure from Alexandria, south wall mosaic dating to the first half of the 12th century, San Clemente Chapel, San Marco.

sternpost, beneath the sterncastle. The lowermost of these lines is thicker than the other three and may indicate a wale.

The rendering of the stem seems confused and incomplete, probably another result of restoration work. The stem is shown curving aft at about 45 degrees. A wooden support appears to run from the upper end of the stem to the middle of the three top-timbers at the bow. The quarter-deck is shown with its one or two upper levels depicted as two simple layers of adjacent squares, with possibly another lower level shown as a series of arches well outside the line of the hull proper. The arched quarter-deck, if in fact part of the original mosaic, may be interpreted as fancy windows, meant to indicate internal cabins such as the *paradisi* or *vanna*, which were the best cabins of a Crusader ship (Pryor, 1984, no. 3: 278). The level of the quarter-deck defined by a series of squares may represent upper internal cabin space or more probably an open decked area. The stem area is known to be of questionable authenticity (Demus, 1984, I: 67).

A circular aperture for the loom of the starboard quarter rudder is located toward the aft end of the sheer strake and the strake below it, placed beneath the forward half of the quarter-deck from whence the rudders would have been worked. The small size and symmetrical shape of the visible oar is not realistic for a ship of this size and may be yet another result of poor restoration.

Weaponry or pole arms also project from the quarter-deck of this vessel, but the features of their tips have been lost.

Figure 13

| | |
|---|---|
| Theme: | The *passus* of the *translatio* of St. Mark (The Ship is Saved from Shipwreck through the Miraculous Intervention of St. Mark).[17] |
| Location: | West half of vault, lower register, San Clemente Chapel, San Marco, Venice. |
| General type: | Large round ship (Type IIIc). |

The narrative continues on the west side of the vault, with a representation of the vessel in danger of shipwreck (Figure 13). This mosaic is fairly well preserved; St. Mark and Stauracius, between the

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[17] *Titulus: TELLUS ADEST NAVTE DIC VELUM PONITE CAVTE.* The cliffs now bear the *titulus ESTUARIE*, but the inscription was altered by the restorers of the 1870's, and originally read *STROALIA*, for the island of Strofadi, where the near-shipwreck was supposed to have occurred (Demus, 1984: 68). According to legend, during the voyage to Venice, St. Mark appeared to the monk Stauracius and warned, "*Surge et dic hominibus istis Veneticis ut citius vela deponant ne patiantur naufragium quia terra non longe est.*" The mariners were warned to take in their sails to avoid shipwreck, as the coast was near.

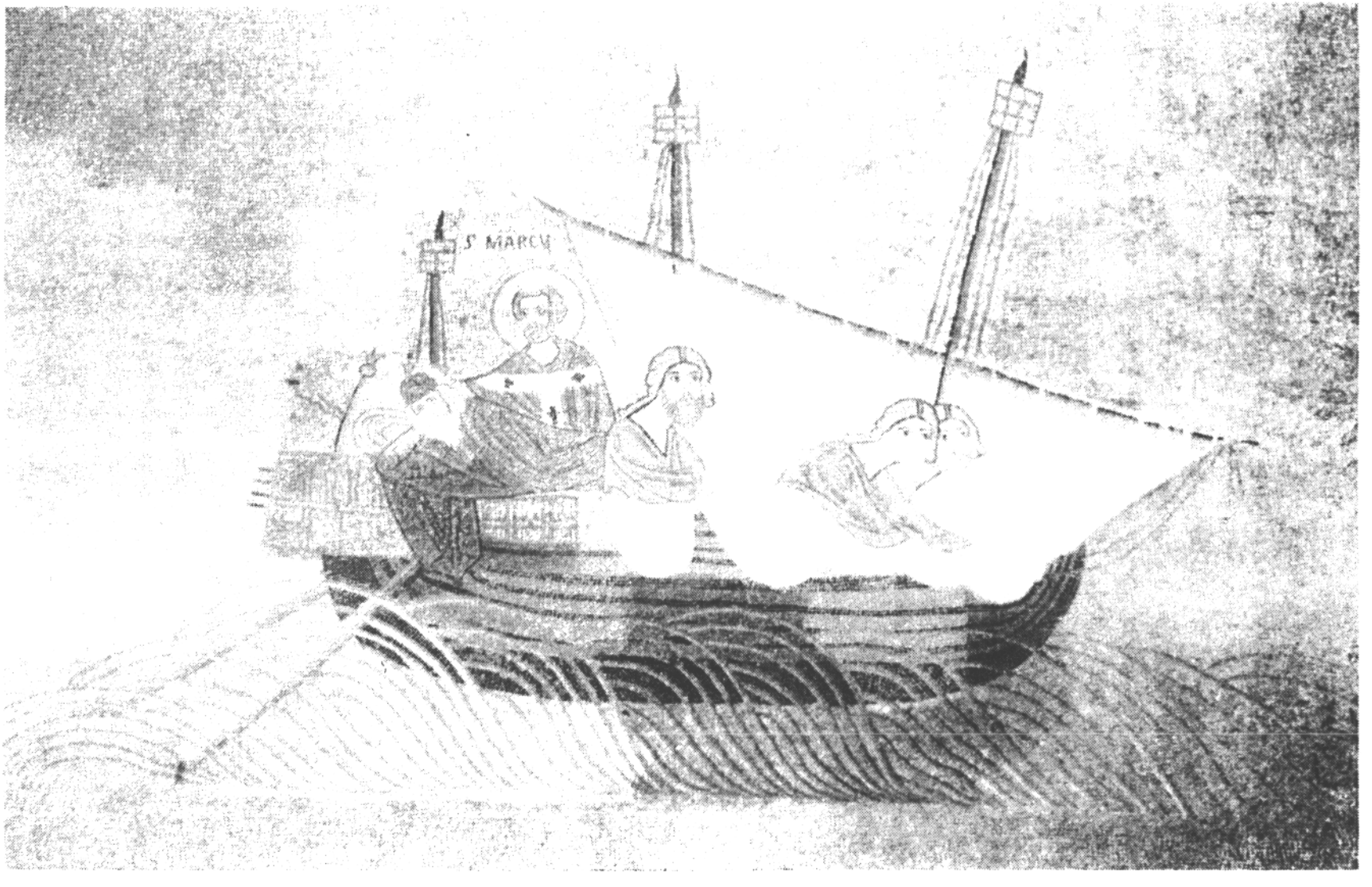



**Figure 13** The *passus* of the *translatio* of St. Mark: St. Mark Saves Ship from Shipwreck, south vault mosaic dating to the first half of the 12th-century, San Clemente Chapel, San Marco.

mizzen and after mast, and the cliffs to the right, are the only areas to have been reset (Demus, 1984, I: 67). More of the original ship remains in this than any mosaic of San Marco's *translatio* cycle.

Two masts stand vertically slightly aft of midships and far aft, while the foremast set at the bow rakes forward at about 13 degrees. Mariners at the bow are in the process of lowering the foresail in order to avoid the dangerous rock cliffs to the right. Two lines attached to the lower end of the *cares* (the lower spar of the yard), represent the *orcia*, called the bowlines, or tack, in English. These lines control the heel of the sail, while the vang, attached to the upper end of the *penna* (the upper spar), which control the peak, is also shown. The sails of the mizzen and after masts have already been lowered, and one of them can be seen furled on its yard, stowed along the central axis of the ship.

Distinguishable in this version of the ship are finial-decorated tips of two inward curving posts at the stern (the port side tip can be seen just above Stauracius' hat, while the starboard tip is left of it). These are probably the upper continuations of structural timbers originating at the keel, or at least lower in the hull, and are significant features for determining the shape of the stern. As discussed for Figure 10, the aperture for the rudder and its orientation to the hull imply a narrowing of the hull below the quarter-deck of the vessel. These timbers indicate that at least the quarter-deck area was square and full, and, if they originated at the keel or from lower wales, the hull below had a flat transom-shape rather than being double-ended.

Two inboard-curving posts are a common feature on medieval ship representations. Interpretation of the feature is still a topic of debate. It is Bonino's opinion that they would have supported a transverse bar, forming a crutch for the yard when not hung on its mast (1978 B: 9). Medieval textual sources mention a feature called *ali*, which translates as "wings". According to Pryor, initially these *ali* finished into the quarter-deck, but "by the great age of the maritime republics, the wings themselves no longer terminated at the after-castle but were swept upwards and backwards through it. In imagery, they were depicted as extensions of the hull above the uppermost complete deck. From a point somewhere abaft amidships the hull of the *corridoria* and bulwarks must have separated into hull proper and wings which remained ..... outboard of the former." Pryor sees these wings as having had two functions: to support the yards when lowered with their furled sails, and to provide a platform from which to sling the steering oars over the

side (1984, no. 3: 276). Zeno's code of 1255 specifies that the *tarrete* type had to have at least three *spontalos* on each side and two in the poop. Lane presumed "these *spontalos* were frames or slings of some sort, used to propel stones (1966: 163)." This may be another viable function of these inboard-curving posts.

The inward-curving posts of medieval depictions may have had any or all of these functions. I believe, however, the *ali* apparent in this and other depictions are structural posts which framed a squared, transom stern similar to that of the Pantano Longarini ship (Throckmorton and Throckmorton, 1973: 244 and 248), or, as Pryor and Bonino have hypothesized, at least framed a squared quarter-deck through which the rudders could be slung and providing a support onto which furled yards could be stowed (See further discussion of *ali* on p. 71).

This representation, in fact, shows furled yards projecting beyond the *ali*. At the after end of the visible furled yard, two lines, , probably the bowlines or tack, lead to the starboard inward curving post, apparently securing the yard to the stern.

A wide, heavy line represents the keel and perhaps several of the bottom hull planks. Strakes are shown continuously up the side of the ship; they run parallel to one another except at the bow, where they converge to finish in the stem.

The quarter-deck consists of two levels: the uppermost is decorated with arches, the lower with simple squares. A section of this deck structure continues almost to midships, much farther forward than in the other depictions, where it terminates close to the rudder aperture. How the quarter rudders were mounted is not clear from this mosaic, since that area has been obscured by Stauracius' cloak. But as other examples of this series show (Figure 10, Figure 12, and Figure 14), it probably likewise passed through a circular aperture beneath the quarter-deck.

The quarter rudders portrayed in this mosaic are symmetrical and small, like those of Figure 12.

Projecting from the quarter-deck are four poles, similar to those found in Figure 10 and Figure 15. One ends in a hook, the others, in diverse spear forms (detail, Figure 11 B).

Figure 14

| | |
|---|---|
| Theme: | *Translatio* of St. Mark: Arrival in Venice. |
| Location: | South wall, lower register, right of window, San Clemente Chapel, San Marco, Venice. |
| General type: | Large round ship (Type IIIc). |

Figure 14, the final mosaic in this cycle, was very badly restored in the 1870's or 1880's, and is considered to be a bad copy only (Demus, 1984, I: 68). This poor restoration must explain the nearly completely vertical orientation of the foremast (implausible for a lateener) depicted thus only in this scene of the cycle.

The vessel is represented at port with its sails furled. From the after end of the furled yard, two lines lead to the quarter-deck near its after end. These lines are probably the bowlines or vang being used to secure the furled yard.

The vertical orientation of the foremast is dubious for a lateen-rigged ship. The crow's-nest on this foremast is also distinct from the other representations in this series: it has been delineated with six small squares set within six larger squares. Other crow's-nests are similarly defined as a series of squares, two to three in each row, but in no other case do the squares contain smaller squares within. What was an arcaded rectangular area below the quarter-deck in the previous mosaic here is a series of squares, two rows of eight squares each, beginning just forward of the rudder aperture and extending aft beyond the sternpost. This area outboard of the hull proper is only depicted in one other scene of this cycle (Figure 12), and in both cases may well be an addition made during renovation. These numerous dissimilarities to the other depictions seem likely due to inaccurate restoration work.

The five uppermost strakes are defined with six semi-parallel lines which converge at the stern and end where the lowest of these lines swoops upwards to form one side of the stem. The exterior side of the stem appears to be a continuation of the line defining the keel. The circular aperture for the elliptically-shaped rudder is set aft and high, between the second and fourth strake.

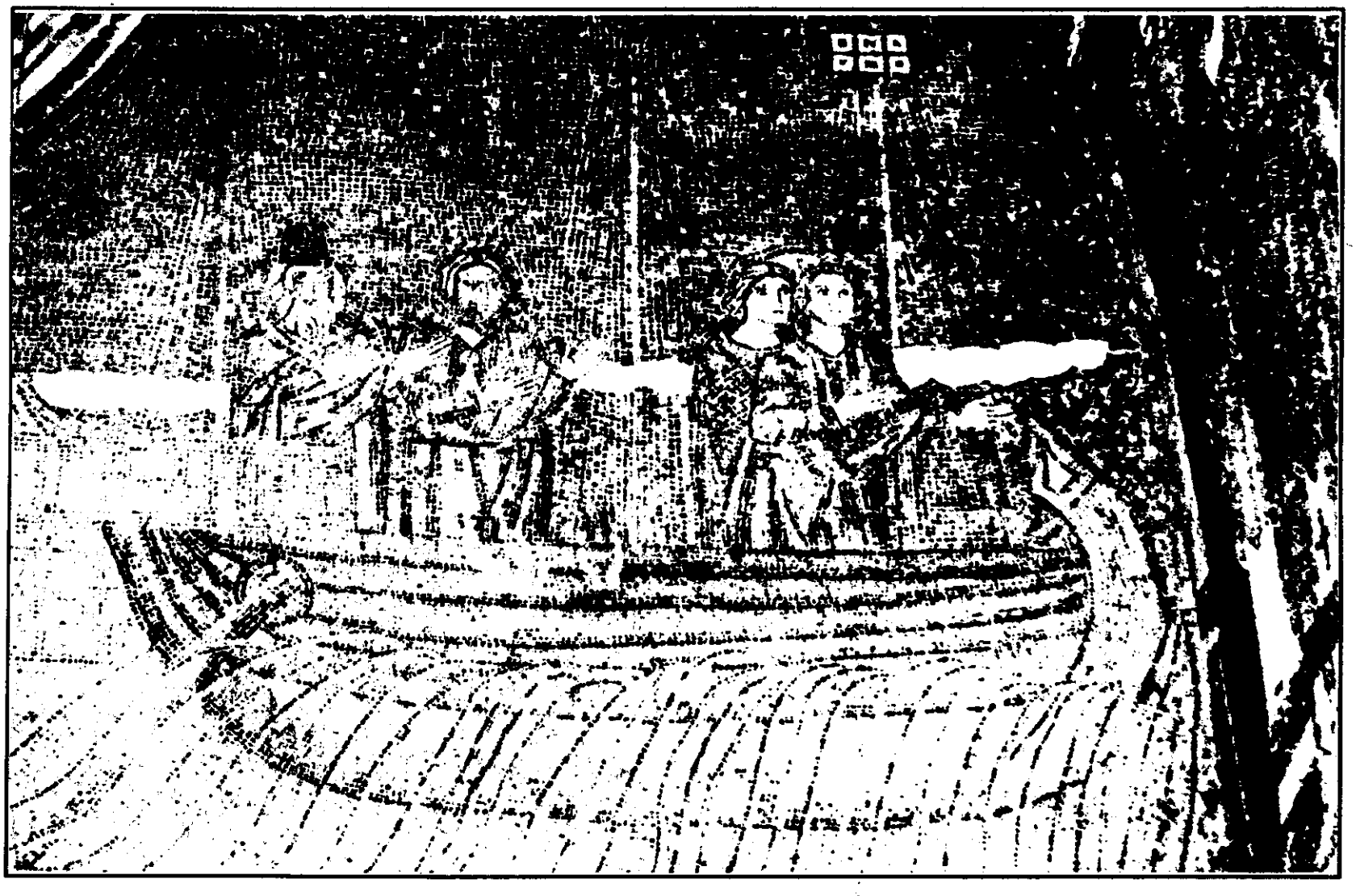


**Figure 14** *Translatio* of St. Mark: Arrival at Venice, west wall mosaic dating to the first half of the 12th-century, San Clemente Chapel, San Marco.

Figure 15

| | |
|---|---|
| Theme: | *Vita* of St. Mark: In the Pentapolis, St. Mark receives divine guidance to leave for Alexandria.[18] |
| Location: | East half of vault, lower register, San Pietro Chapel, San Marco, Venice. |
| Date: | Second quarter of the 12th century |
| General type: | Large round ship (Type IIIc). |
| View: | Starboard profile. |

In the vault immediately to the northwest of the main altar, mosaics portray scenes from the *vitae* of SS. Mark and Peter which emphasize the prehistory and ecclesiastical dominion of the Venetian church (Demus, 1988: 28 and 96). In the one maritime scene (Figure 15), St. Mark, having been called to go evangelize, is directed by an angel, and he sails for Alexandria, Egypt.

The preservation of this mosaic is generally quite good. The golden teardrop shapes along the side of the quarter-deck at the stern are the only areas missing their original tesserae, which have been replaced with gold ones. Thus the repairs stand out clearly in this mosaic and the remainder of the mosaic is believed to be authentic (Demus, 1984, I: 63).

In many respects, this vessel is similar to the three-masted, lateen-rigged vessel in the San Clemente *translatio* cycle located across the altar (Figure 10, Figure 12, Figure 13, and Figure 14). Its foremast is tallest, and is set far forward in the bow while the after mast is shortest. The sails of the foremast and after mast are set, while the mizzen's sail is furled on its yard which has been stored along the center of the ship. The foresail is decorated with two florets or crosses. On both set sails, two lines represent the tack or bowlines. Robands along the yard of each of these sails are clearly visible. Shrouds or stays of all masts are generically depicted, two to a side, if any at all.

[18] *Titulus: NVNCIAT HIC PERGIT SVTORIS VVLNERA TERGIT.*

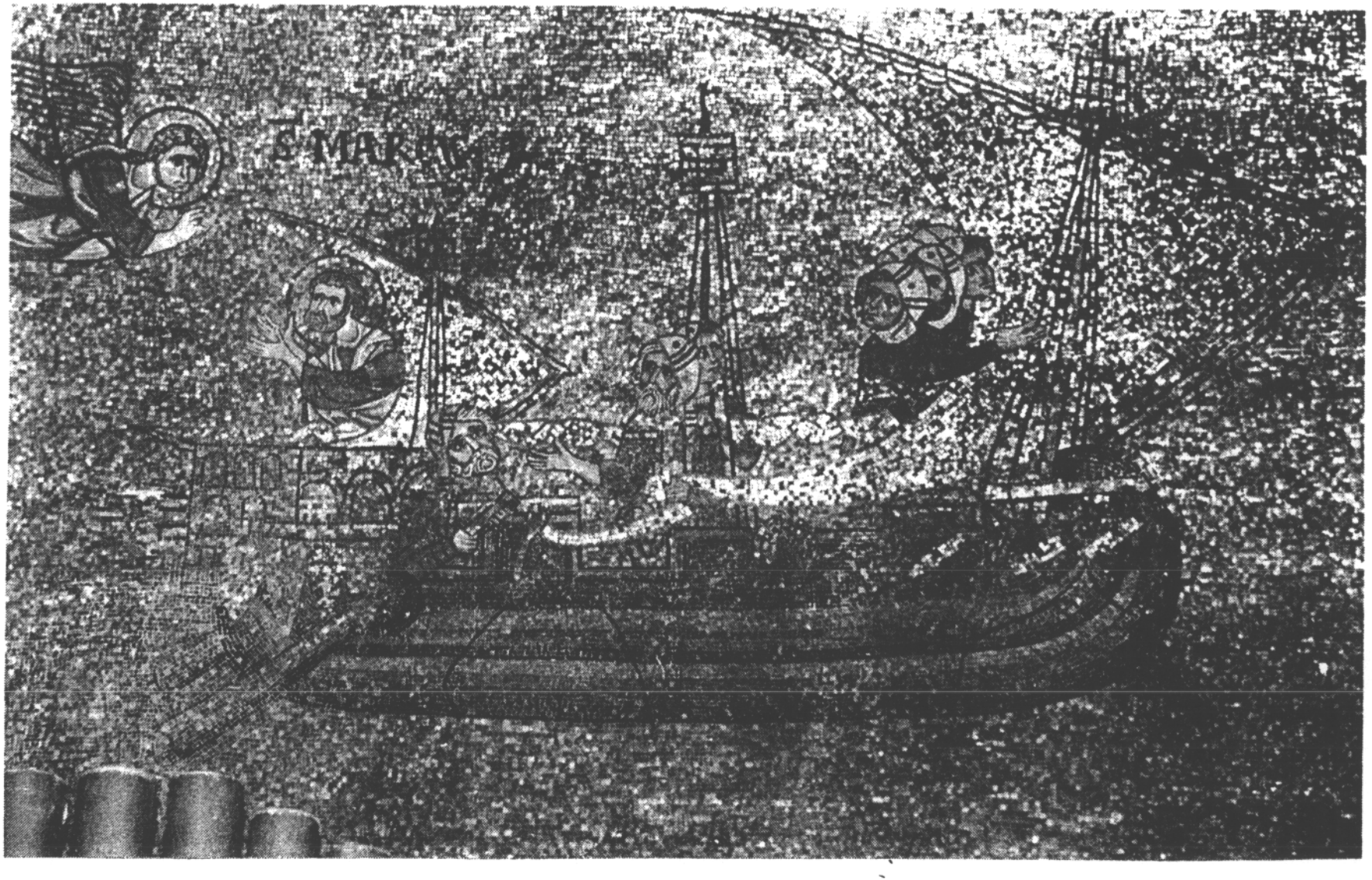


**Figure 15** *Vita* of St. Mark: St. Mark Receives Divine Guidance to Leave for Alexandria, 12th-century, east vault mosaic, San Pietro Chapel, San Marco.

A quarter-deck is shown with arched windows, and another small cabin beneath has been represented with a series of squares, which probably indicate the windows of internal cabin space.

The helmsman working the starboard quarter rudder is shown in an unnecessary and awkward position leaning outside the sheer; the loom passes inboard through an aperture in the side of the hull for steerage from the quarter-deck. The gunwale strake is irregular: two sections are lowered, at midships and aft. This illustrates the movable side panels found on the Contarina ship (Contarina I), where a section of the side planking could slide aside in a groove, thus providing an opening for loading cargo (Relazione, 1901: 30; see discussion, p. 225). Similar examples can be seen in the figure on p. 108, and a 15th-century fresco painting of the conversion of St. Ranieri by Andrea da Firenze (in the Camposanto of Pisa), modeled after a 13th-century original by Giotto (Casson, 1964 B: fig. 96 and Nebbia, 1932: fig. 17).

The top-timbers of all visible frames are utilized; various lines are shown tied off to these bitts.

Three anchors with fixed anchor stocks are hung from their rings off the starboard bow in a semi-vertical position, with their crowns slightly forward; this is the only example found in such a position. The shank is usually placed horizontally, with the crown almost always aft (as in the figs. on pp. 79, 108, 110, 147, and 167). No hawse holes have been represented. Presumably during this early medieval period, the anchors' cables were passed over the sheer strake to be made fast inboard.

Four poles project from the quarter-deck (Figure 11 C) similar to those discussed for Figure 10 and Figure 13. The point of the uppermost pole resembles the second lowest of Figure 10.

Figure 16

| | |
|---|---|
| Theme: | The Miraculous Draught of Fishes [19] |
| Location: | East half of vault, East bay of the North transept, San Marco, Venice. |
| Date: | Second quarter of 12th century |
| General type: | Small fishing boat (Type Ic). |
| View: | Starboard side, seen slightly from bow and above. |

The prototype for this cycle (Figure 16 and Figure 17) was an 11th-century Byzantine Gospel book (Demus, 1988: 50). According to Demus, the mosaic of Figure 16 has been badly restored, but the iconography accurately recorded (Demus, 1984, I: 121). This means the vessel itself must be considered with caution.

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[19] *Titulus: IVSSIT PISCANTVR CAPIVNTVR VEL NVMERANTVR.*




**Figure 16** The Miraculous Draught of Fishes, 12th-century vault mosaic, north transept, east bay, San Marco.

In the east half of the vault, Christ is shown in the stern of a small boat with seven of his disciples. The figures are emphasized and therefore are enlarged, making the small boat appear dangerously overloaded. Peter (depicted with a short beard and hair) and Andrew (depicted with a long beard) draw in fishing nets, while Christ turns toward the Pharisees at shore to speak to them.

Both this vessel and that of Figure 17 are small fishing craft of similar dimensions. Although the keel of both boats is hidden by the waves, it appears in both cases to be relatively straight, and to run parallel to the horizontal sheer strake. There the similarities end.

In Figure 16, the stem, slightly higher than the stern, is inward-curving, and shows an angular join to the sheer strake. At the stern, two sturdy wales sweep upward to form a squared stern. The area between these two posts is presumably filled in with horizontal planking, creating a flat transom stern. Four parallel lines which converge slightly at the stern, generically define the three uppermost strakes. A scarf, and possibly two nails, can be seen between the stem and the keel or a lower-most visible strake at the bow.

Oars have been mounted far forward and slightly aft of midship. Their round looms pass through grommets hung on thole pins. The two starboard oars have slender, symmetrical blades; the shapes of the aft oar and part of one of the port oars can be seen amidst the waves.

Figure 17

| | |
|---|---|
| Theme: | The Stilling of the Tempest.[20] |
| Location: | West half of vault, East bay of the North transept, San Marco, Venice. |
| Date: | Second quarter of the 12th century |
| General type: | Small fishing boat (Type Ic). |
| View: | Starboard side, seen slightly from bow. |

Like the boat mosaic across the vault (Figure 16), this mosaic has been poorly restored (Demus, 1984, I: 120), and should be considered with due caution. Christ has been portrayed twice; he is shown sleeping in the bow of the small boat, and again, awakened at the stern, from whence he calms the stormy seas.

[20] *Titulus: SOMNVS DISCESSIT VIGILANS MARE FLVMINA PRESSIT.*




**Figure 17** The Stilling of the Tempest, 12th-century vault mosaic, north transept, west bay, San Marco.

The vessel depicted in Figure 17 is similar to the boat of Figure 16 both in size and characteristics. Each has, apparently, a relatively straight keel and horizontal sheer strake. Certain other features, however, are quite different: the two posts at the stern project much higher, and are not wales but extensions of the sheer strake. The four visible strakes converge and finish beneath the half deck at the sheer strake instead of at the posts. The shape of the stern is rather unusual. The hull itself appears to bulge outward below where the hull planking finishes at the sheer strake. The sheer strake continues as upward posts, presumably partly filled in with transom stern planking similar to the Pantano Longarini vessel, where port and starboard water line wales were joined in a point at the stern (van Doorninck, 1972: fig. 34). A straight scarf with two nails has been defined between the uppermost strake and the inward-curving stem.

Five oars passing through grommets hung on tholepins are equally spaced amidships.

Figure 18, Figure 19, Figure 20, Figure 21

| | |
|---|---|
| Theme: | Episodes from the 4th Crusade: the taking of Zara and Constantinople.<br>Figure 18 Ship with trumpeter in crow's-nest.<br>Figure 19 Ship during a siege, bow only.<br>Figure 20 Ship during a siege.<br>Figure 21 Ship, stern only. |
| Location: | Originally floor mosaics, now fragments framed and hung along south walls, San Giovanni Evangelista, Ravenna. |
| Date: | 1213 (Carile, 1976: 112 and Bovini, 1971: 42). |
| General type: | Four war transports (Type IIb), specially adapted round ships. |
| Views: | Port sides slightly from stern. |

These four ship mosaics, originally from the floor pavement of San Giovanni Evangelista, may well illustrate a *usiache (usciere)* or *nave latine*, the Crusader horse transport discussed in chroniclers' reports of the 4th Crusade (e.g., Robert Geoffrey de Clari and J. de Villehardouin). The ships lack oars, and their full shape reveals, although clearly associated with war, such transports would have relied on sail power and could also be used for commerce. Three of these exceptionally realistic medieval ship mosaics are fragmentary; only one is complete (Figure 18). All four reveal common features almost to the last detail, and are therefore discussed as a group.

In each representation, the masts, sails, keel, and several rows of wales and parallel-running strakes have been delineated. The hull's box-like shape is emphasized, represented as a line drawing.

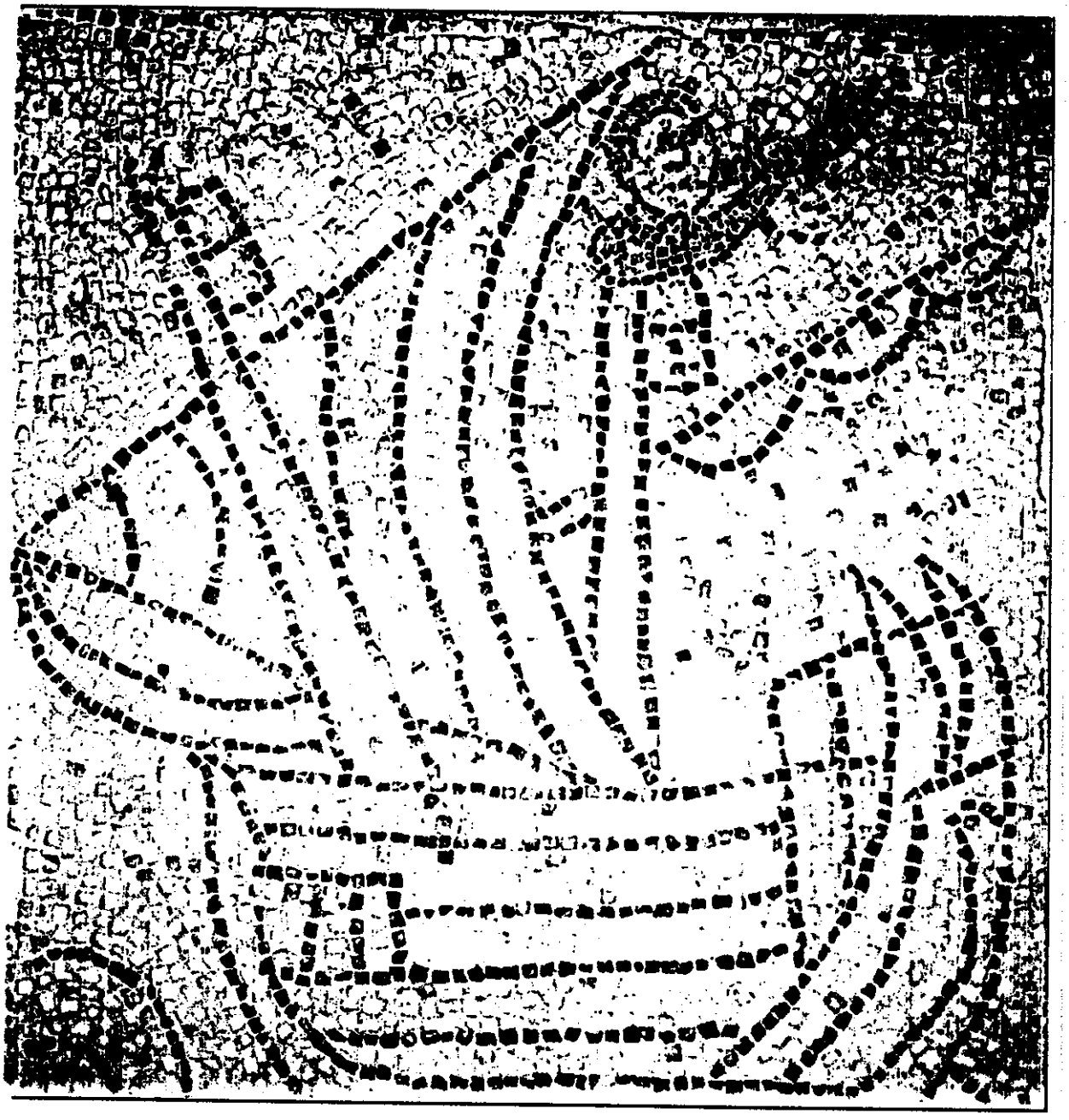


**Figure 18** Ship of the Fourth Crusade, with trumpeter in the crow's-nest. Originally part of floor mosaic (1235), San Giovanni Evangelista, Ravenna.

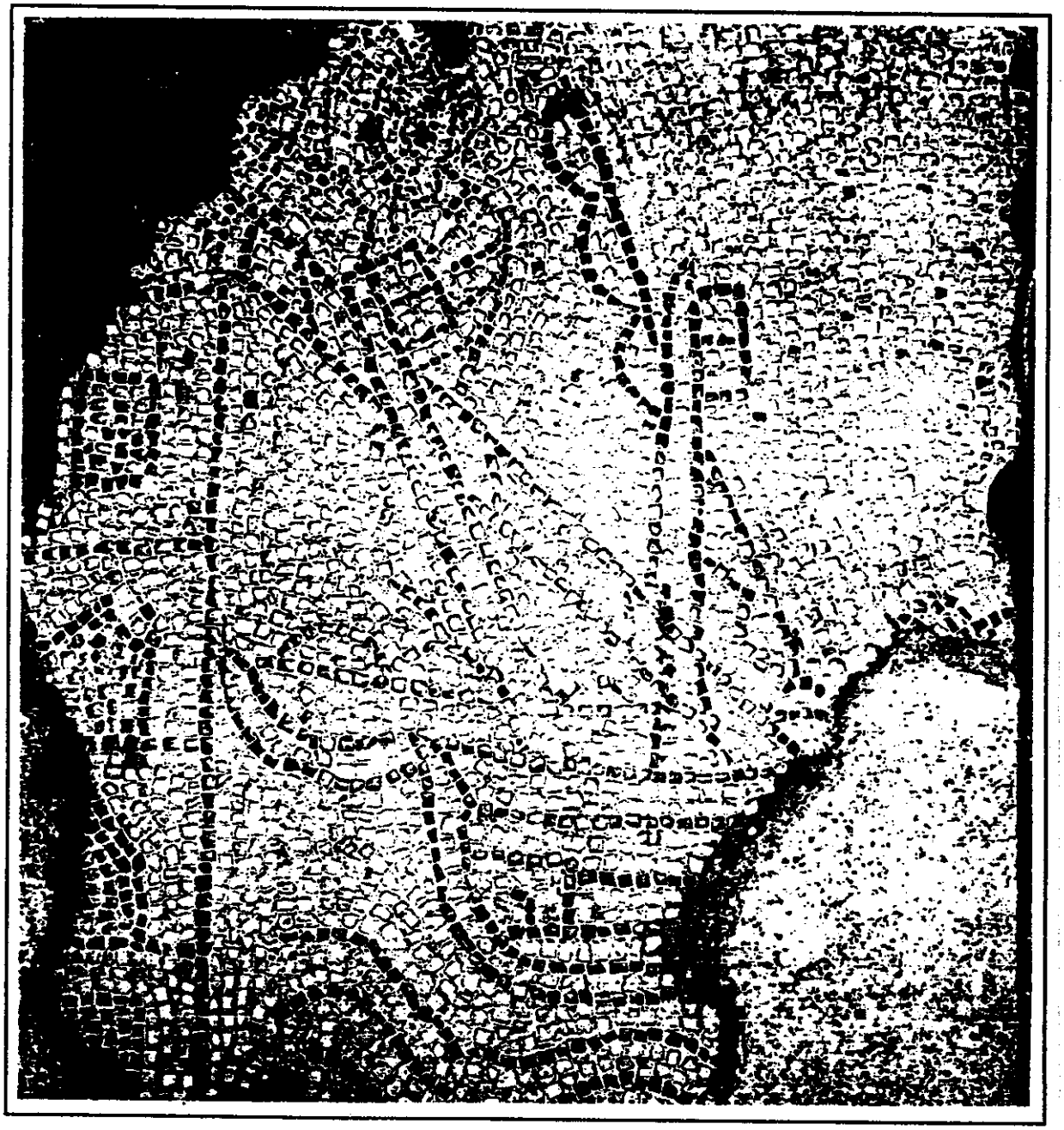


Figure 19 Fragmentary floor mosaic depicting bow of a ship of the Fourth Crusade during siege (1235), San Giovanni Evangelista, Ravenna.



**Figure 20** Fragmentary floor mosaic depicting a ship of the Fourth Crusade during siege (1235), San Giovanni Evangelista, Ravenna.



**Figure 21** Fragmentary floor mosaic depicting stern of a ship of the Fourth Crusade (1235), San Giovanni Evangelista, Ravenna.

Wherever preserved, the crow's-nest is shown set to the aft or side of the masts, a practical position which would have easily allowed a lateen-rigged ship to tack.

Figure 18, the intact mosaic, illustrates a two-masted lateen-rigged ship. A trumpeter in the crow's-nest atop the vertical mizzen mast calls the other ships to commence their journey to the Holy Land (Carile, 1976: 120).[21] The mizzen's sail is furled, and its yard is canted at about 120 degrees to starboard. The yard of the foresail is also canted off its mast to starboard at about 120 degrees. The taller foremast at the bow rakes forward at about 20 degrees while the one at midships is vertical. The two bowlines or tack of the foresail lead from the *cares*, and are tied off to near the base of the mast. Slightly curving vertical lines seen on the sail (as in the figs. on pp. 50, 52, 77, 79, 139, 167, and 200), indicate the rectangular sections of cloth that were sewn together to form lateen sails. According to Pryor (1984, no. 4: 365), lateen sails were not plane but were bellied. This would explain the slight curvature given to these seam lines.

Out of the three ship mosaics of San Giovanni Evangelista, it is in Figure 18 that the box-like shape of the hull is completely evident. Due to the lack of accurate perspective, a straight keel and end of the stern are shown. Both these features would not have both been visible in a precise profile view of an actual ship. These features must have been considered significant characteristics distinguishing a certain ship type. The mosaicist made no attempt to delineate scarfs; a straight keel and posts are shown as a continuous timber. He did attempt to define the complex shape of the stern. Two large timbers flank the inward-curving sternpost. They are clearly structural, beginning at the aft end of the keel and sweeping parallel, tine-like, upwards and inboard. Two lines drawn with perspective roughly perpendicular to these timbers suggest the presence of some sort of transom stern. I believe the lower horizontal element represents the *trigànte* (tragent) specified for two-decked round ships of the Crusader contracts (Pryor, 1984, no. 3: 278) and more clearly depicted in the figure on page 79.[22] According to Pryor, a *paradisus* cabin lay

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[21] By 1255, two trumpeters were required to accompany all *nave* larger than 188 dead weight tons going beyond the Adriatic (Zeno's code XXII, Predelli and Sacerdoti, 1903: 93).

[22] The term *trigànte* occurs in two contracts St. Louis made with Genoa in 1246, which were quite similar to those he arranged with Venice in 1268. It is "a lateral beam set into the top of the sternpost to provide the base for the after-castle." (Pryor, 1984, no. 3: 278).

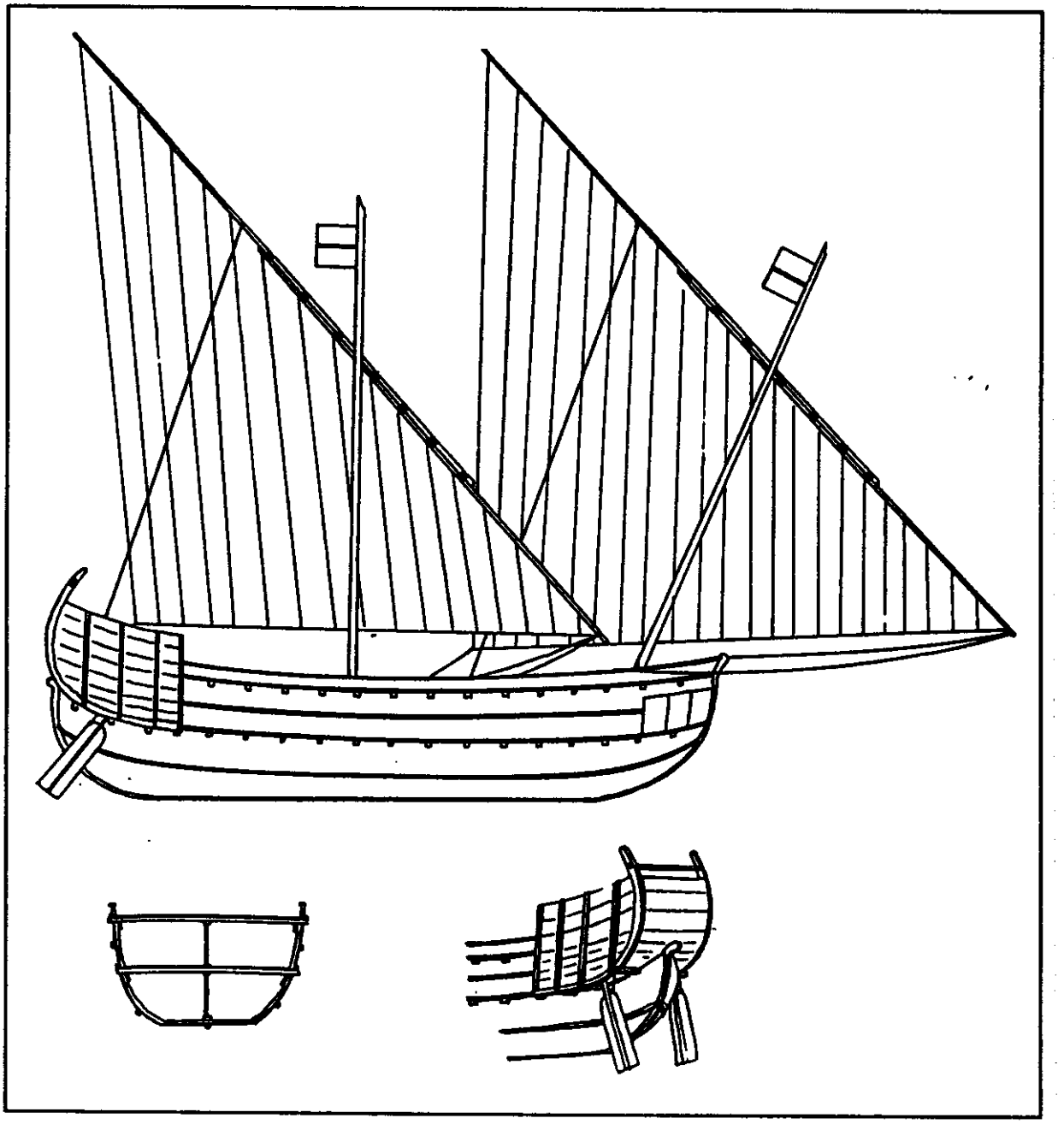


**Figure 22** Reconstruction of Crusader ships of the Fourth Crusade in 1202, based on the ship mosaics of San Giovanni Evangelista, Ravenna (Bonino, 1978 A: fig. 13).

between the uppermost complete deck and finished at the top of the sternpost below the tragent. The *trigànte* itself was surmounted by a *castellum*.

The bow area is more simply terminated, with strakes of consistent width finishing into the stem. Three vertical lines at the bow may be interpreted as either a window or perhaps a door at the lower deck level. The extra-large tesserae near the tops of these three lines may represent bitts.

Only the starboard quarter rudder has been depicted in the mosaic. Because this rudder is mounted on the far side of the vessel, the mounting and details of its shape cannot be seen. It is unusual for only one quarter rudder to be depicted; two quarter rudders would have been necessary. Presumably the ship actually had a pair of rudders, and the port side rudder could be let down when required. Such large rudders would have doubled as steering leeboards.

Only the bow area of the two-masted, lateen-rigged ship of Figure 19 has survived. The mizzen mast is vertically set, while the main foremast rakes forward at about 21 degrees. Sails are furled: the yard of the mizzen is stored, almost vertically, at about eighteen degrees off the mast, while the foremast's yard is stored, roughly horizontally, above deck level. From the crow's-nest on the foremast a crusader prepares to besiege a city (note the siege machinery supported by the mast, leaning toward the city walls). The details of the hull are identical to that of Figure 18, with the exception of the short vertical lines at bow: here there are only two vertical lines, placed lower in the hull and slightly further aft.

A second fragmentary image, Figure 20, shows another two-masted lateener, similar in hull shape to Figure 18, and with siege apparatus as represented in Figure 19. The bow and top of the mast areas have been obliterated, but the rest is well preserved.

The last fragmentary mosaic (Figure 21) shows the ship's stern and mizzen mast. The sail of this mizzen mast is furled, but the remaining bottom corner of the foresail shows it to be open and lateen. As in Figure 18, above the inward curving sternpost, two large posts project upward and curve inboard. Perpendicular to these posts the artist has again emphasized a square structure.

Bonino has done a fine reconstruction of the ship type represented in these mosaics (Figure 22). He calculates their dimensions to have been approximately 33.2 m. long, with a beam of 9.6 m, and their rate of travel to have been approximately 5 knots. These proportions are inferred from

> ...the distance between the two decks, the height of the ports, the position of the foremast with respect to the structure of the prow, probably protruding cross beams, ports stem, and topgallant bulwark, the shape of the raised quarter-deck (*paradisus*) and of its ends, which rise above the railing-like wings (*ali*), in order to build a stand on which the yards could rest, and the yards (Bonino, 1978 B: 9).

The roughly contemporaneous San Marco ship mosaics (Figure 10, Figure 12, Figure 13, Figure 14, and Figure 15) clearly depict two rudders passing through circular ports in the hull, and not through the floor of the quarter-deck as Bonino has reconstructed.

Bonino has interpreted the vertical lines at the bows of Figure 18 and Figure 19 to be defining a horse port (Bonino, 1978 B: 12). I believe, in light of the revealing illustration of the figure on page 187 (Pataky and Marjai, 1973: Pl. 7) where horses are apparently being loaded from the stern, that these lines must represent some other feature, and the *ali* are in fact structural timbers framing a horse port at the stern. It is certain that horse ports, wherever they were, were nailed closed, sealed, and caulked, since the lower part of the door sat below the water line while under way. Pryor has suggested that the vertical lines in this representation may portray an open deck area beneath the level of the *corridoria* and bulwarks, where vertical uprights seem to be bitts for anchor cables or posts for windlasses in other representations, such as a miniature from *Annales Ianuenses*, and a bas relief on the leaning tower of Pisa (1984, no. 3: 277 and figures 1 L and K).

Figure 23

| | |
|---|---|
| Theme: | *Translatio* of St. Mark. |
| Location: | Original facade mosaic above fourth portal (in the sopraporta, the arched area above the door), immediately to the right of the main entrance, San Marco. After painting by Gentile Bellini, 1496, now in Galleria dell'Accademia, Venice.[23] |
| Date: | ca. 1260-1270 (Demus, 1988: 187). |
| General type: | Two medium-sized round ships (Type IIIb) and one lighter (Type Ib). |
| View: | Port profile. |

A 13th-century *translatio* cycle which decorated four of the five portal niches of San Marco's facade has been completely obliterated by newer Baroque compositions. The original cycle may have incorporated as many as eleven scenes of the *translatio* story; seven are visible in a painting by Gentile Bellini of a Procession in San Marco during the 15th

[23] Demus, 1984, vol. II: Pl. 348.

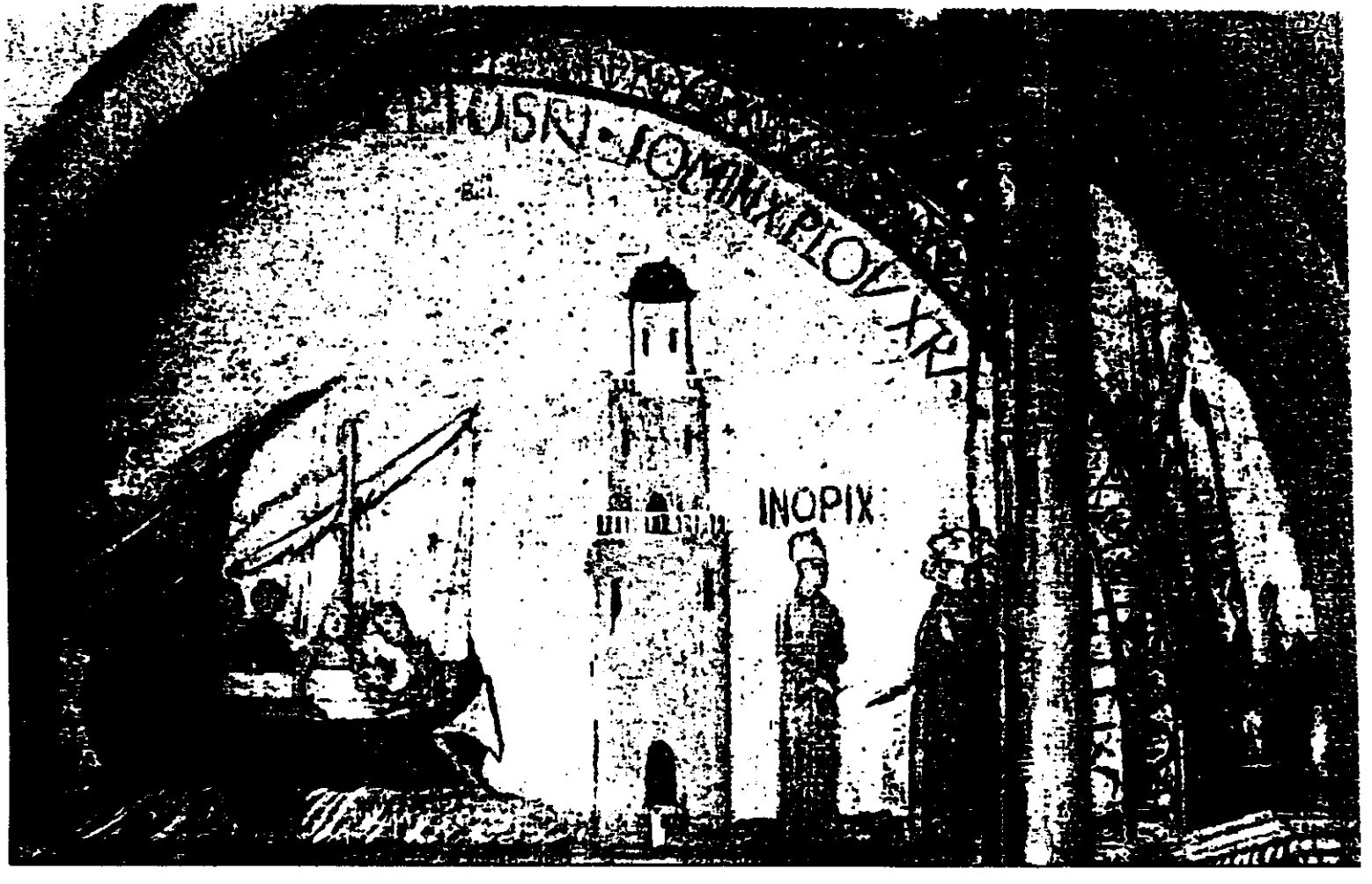



**Figure 23** *Translatio* of St. Mark, original facade mosaic (ca. 1260-1270), San Marco, after G. Bellini's painting, "Procession in Piazza San Marco," ca. 1496, Galleria dell'Accademia (Demus, 1984, vol. II: fig. 348).

century (Demus, 1984, I: 66 and II: Pl. 348), and two of these seven contain ships and boats. From the early literary description of it by Stringa, we know which segments of the *Translatio* story were represented in the original facade. The *titulus* of the first sopraporta (pictured in the Bellini painting) reads:

> *Tollitur ex archa furtim marcus patriarcha quem sporta ponunt carnes, caulesque reponunt; canzir dicentes marcum vitant referentes: in barcam corpus mittunt ex rupe deorsum.* (Demus, 1984, I: 199),

meaning that the relics were put in a boat to be taken to the ship of the Venetian merchants. The second sopraporta's inscription continued:

> *De scapha sportam tollunt velisque reponunt;*
> *Presbyter has turbas verens non vadit ad urnas.*
> *Clam Monachus Marcum sequitur, quem thure recondunt.*
> *Tellus adest, Nautae dic, velum ponite caute.*
> (Demus, 1984, I: 200),

describing the subsequent scenes of the cycle, including the hiding of the relics in the sail.

Only two of the maritime scenes are known from Bellini's painting. In Figure 23, the portrayal of the Basket with the Relics being Transferred from the Boat to the Ship, although very difficult to make out, is visible in a foreshortened rendition on the right side of the barrel vault. In the lunette (the flat area of the sopraporta), the ship, ready to set sail, is better portrayed. In the right half of the lunette, the priest Theodorus, who can easily be identified by his white hat, stands to the right of the *Pharos*, the lighthouse of Alexandria. To its left, a two-masted vessel, with its foremast raking forward at 32 degrees, prepares to sail. The two subsequent scenes in the hidden left side of the barrel vault are not visible in Bellini's painting, but from Stringa's record of its *titulus*, it is known that these positions originally depicted the Loading of the Relics into a Boat (*In barcam corpus mittunt*), the Saving of the Vessel from Shipwreck (*Tellus adest, naut[a]e dic, velum ponite caute*), and a final scene, most likely the Arrival of the Ship in Venice (Demus, 1984, I: 199-201).

The ship which has been preserved for us in Bellini's painting is a medium-sized two-masted, lateen-rigged round ship. Because this portal is such a tiny part of Bellini's composition, the details of the ship are gross. The portal representation, however, still provides us

some information. The mizzen's sail is furled on its yard, but the foresail has been set, and the ship is setting out from port. Shrouds are vague, but discernable. The tack of the main mast is defined, as is the vang of the mizzen mast, passing through its block twice to gain advantage. The general hull shape and the triangular-shaped rudder mount reflect a small round ship type like that of the figure on page 77.

Figure 24

| | |
|---|---|
| Theme: | *Vita*: Dream Vision of St. Mark.[24] |
| Location: | East half of vault, lower tier, Zen Chapel, San Marco, Venice. |
| Date: | ca. 1270's (Demus, 1988: 182). |
| General type: | Small lagoonal craft (Type Ia). |
| View: | Starboard profile. |

St. Mark and two companions rest in a small boat which is tied to a piling. This method of mooring is still practiced today in the Venetian lagoons and elsewhere. The figures, especially the central one and the angel above, are badly disfigured due to an early 19th-century restoration (Demus, 1984, I: 186).

The small craft is a simple boat with a quarter rudder, which is shown affixed to starboard aft through a box mount, with the flared side of the blade "downstream." A steering oar could also be mounted at the bow for facility in river and lagoonal navigation. The shape of the oarlock, set oar slot aft at the port bow, is characteristic of Venetian watercraft to this day.

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[24] *Titulus: CUM TRANSITUM FACERET PER MARE UBI NVNC POSITA EST ECCLESIA SCI MARCI ANGELVS EI NUNCIATUIT QVOD POST ALIQVANTUM TEMPVS A MORTE IPSIVS CORPVS EIVS HIC HONORIFICE LOCARETVR.*



**Figure 24** *Vita* of St. Mark: Dream Vision, east vault mosaic (ca. 1270), Zen Chapel, San Marco.

**Figure 25**

| | |
|---|---|
| **Theme:** | *Vita* of St. Mark: The Voyage to Alexandria.[25] |
| **Location:** | West half of vault, upper tier, Zen chapel, San Marco, Venice. |
| **Date:** | ca. 1270's (Demus, 1988: 182). |
| **General type:** | Small round ship (Type IIIa). |
| **View:** | Starboard profile. |

St. Mark's head in this mosaic is much affected by an early 19th-century restoration, but otherwise the mosaic is believed to be authentic (Demus, 1984, I: 186).[26]

St. Mark and two mariners hoist the sail of the single mast and set off for Alexandria. The mosaic is not nautically accurate. Perhaps original accurate details have been lost and tesserae erroneously replaced. One significant oversight is apparent as the mariner to the right hauls on a line. It stops at the yard instead of the head of the mast, and no pulley or top tackle has been depicted. It certainly is not a complete halyard system. Perhaps, however, this should be interpreted otherwise. The tack, which the same mariner appears to hold, seems, in fact, to be attached to the yard where it attaches to the mast. Such a set up may have been intentionally designed for some purpose, but seems peculiar. Another questionable feature is the rake of the mast; 32 degrees off vertical is too extreme for any lateen rig. No shrouds or stays have been indicated.

The similarity between the stern of this ship and that seen in other medieval illustrations such as those on pages 72 and 105 leads one to believe, nonetheless, that these mosaics do reflect a general small ship type, one characterized by its full rounded shape, a triangular-shaped rudder mount, and a small, quarter-deck area with railing at the stern, from whence a helmsman steered the vessel.

Although details of the quarter rudder are difficult to make out, the loom certainly is secured with a modified box mount, a wooden collar, and passes inboard to the helmsman. A rudder hoist is also evident, attached to the rudder blade.

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[25] *Titulus: PERGIT NAVIGIO ALEXANDRIAM.*

[26] For another copy of the mosaic, see Demus, 1984, vol. I: fig. 51.



**Figure 25** *Vita* of St. Mark: The Voyage to Alexandria, west vault mosaic (ca. 1270), Zen Chapel, San Marco.

Figure 26

| | |
|---|---|
| Theme: | *Vita* of St. Isidore: St. Isidore and Amenion Depart from Alexandria (Kaftal, 1978: 434). |
| Cartoon artist: | Paolo Veneziano (Muraro, 1970: 27). |
| Location: | South wall of San Isidore Chapel, lower register, San Marco, Venice. |
| Date: | ca. 1348-55 (Muraro, 1970: 26). |
| General type: | Medium-large round ship (Type IIIb). |
| View: | Starboard side, viewed from the stern. |

St. Isidore, Amenion, and several mariners set sail from port. Their vessel is a large two-masted round ship fitted with lateen sails. As usual, the foremast is the taller mast, and rakes forward. Vertical lines on the sails delineate the vertical strips of cloth which made up the sail. Two crow's-nests are secured atop the masts, aft. A backstay and the starboard vang are apparent on the foremast; on the mizzen, the port vang is depicted. No tackle is evident. Wedges, lashed tightly in place, gird the base of the mast. These wooden chocks were placed around the mast where it passed into the partner, to immobilize the mast and help set it to the desired inclination (as in the figs. on pp. 83, 135, and 177. A backstay of the mizzen, for each yard, vangs, and robands on both sails, are clearly depicted.

Details of the hull planking are remarkably distinct for mosaic work. Rows of straking alternate between thick and thinner strakes. A regular nailing pattern is evident on all the wide strakes, and in the third (from above) depicted row of straking, seven through beams project through the hull. These through beams supported the deck. Strakes at the ample rounded stern finish under a horizontal beam designating the tragent. Described in St. Louis' contracts for Crusader transports, the *trigànte*, "a lateral beam set into the top of the sternpost to provide the base for the after-castle (Pryor, 1984, no. 3: 278)," is well defined in this view of the ship's stern.

Parts of both foil-shaped quarter rudders can be seen at the stern. The loom of the more visible starboard rudder is shown passing through a square box mount and then inboard through the floor of the strong quarter-deck. A stock-less anchor, slung through two ropes, hangs at the bow.

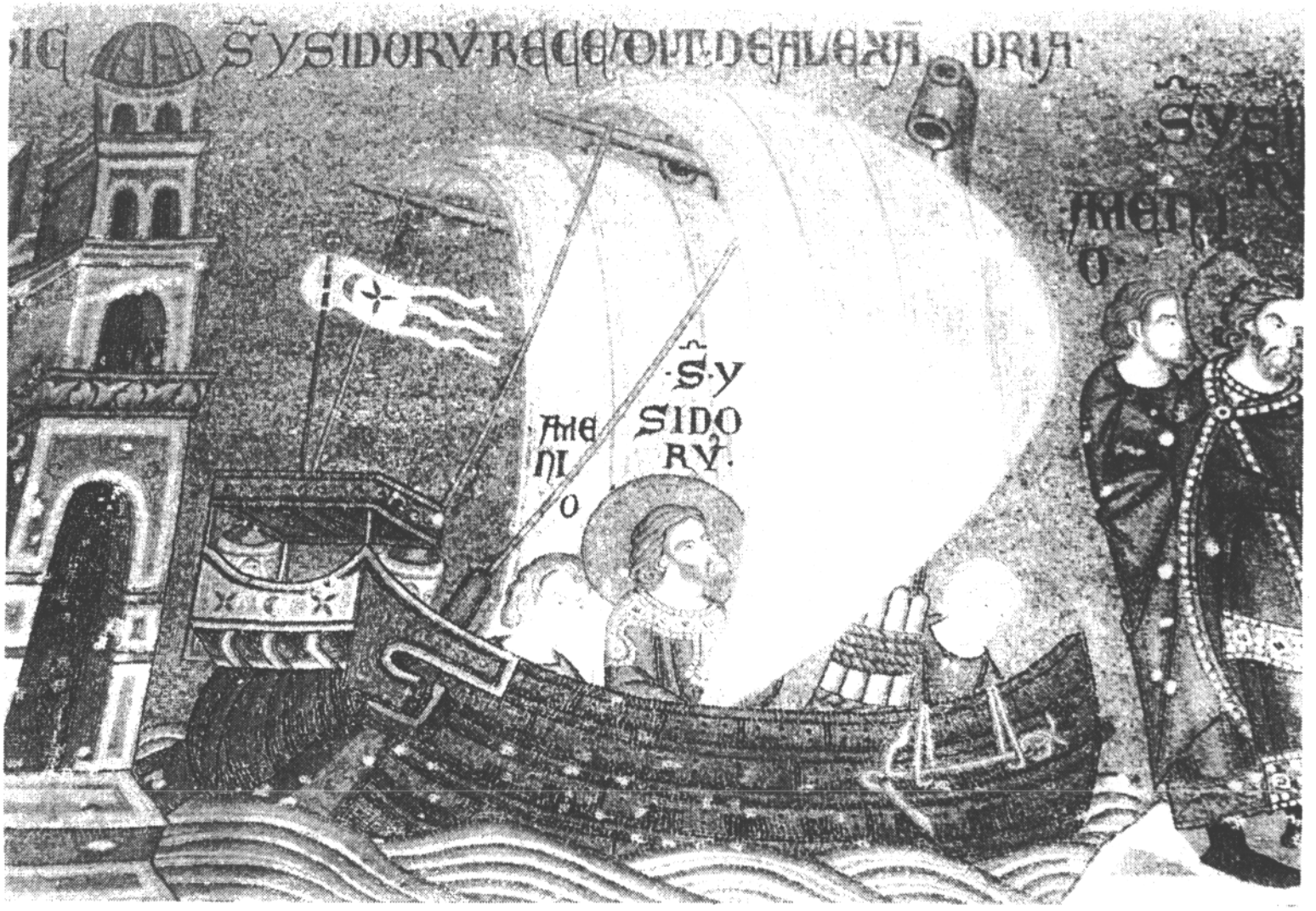


**Figure 26** *Vita* of St. Isidore: St. Isidore and Amenion Depart from Alexandria, mosaic (ca. 1350), south wall, San Isidore Chapel, San Marco.

Figure 27

| | |
|---|---|
| Theme: | *Translatio* of St. Isidore: The Doge Michiel and the Priest Cerbanus Arrive in Chios (Kaftal, 1978: 434). |
| Cartoon artist: | Paolo Veneziano (Muraro, 1970: 27). |
| Location: | North wall of San Isidore Chapel, left of window, San Marco, Venice. |
| Date: | ca. 1348-1355 (Muraro, 1970: 26). |
| General type: | Two oared galleys (Type IIa). |
| View: | Port profiles, only midships to sterns. |

In this scene of the arrival of a Venetian fleet in Chios, two dromons, long, oared warships, are shown in the process of unloading. Gangplanks have been set to shore from the stern. Both warships have a small, raised quarter-deck. In this area, two Y-shaped upright poles or stantions support a horizontal bar which in turn provides the frame for a tented area comparable to ones seen on later Venetian galleys (the figs. on pp. 132, 139, and 141). The oarsmen sit two to a bench, all on the same level, in an arrangement called *a zenzile* in Italian. This arrangement reflects the latter of a two-step evolutionary process which came about in Mediterranean warships during the late 13th and early 14th centuries. Previously, dromons had two banks of oarsmen seated within the hull of the earlier bireme dromon. The first evolutionary stage raised both decks - the lower oarsmen pulled oars which pivoted on the sheer, while the upper level of oarsmen pulled against an outrigger, as is the case for the figure on page 98 (Casson, 1964 B: 70). Approximately at the turn of the 14th century, a lower and more seaworthy hull was developed by placing the oarsmen all on the same level within the hull on diagonally-set benches. The men sat with all their oars in this arrangement, called *a terzaurolo*, two to three on a bench. Since their oars pivoted on the outrigger, the oars had to be lengthened. The resulting system clustered the oars in groups of two to three, and made rowing from a completely seated position impossible (Casson, 1964 B: 72). The design offered a lower center of gravity, however, without decreasing power, and the lengthened oars provided greater leverage. This meant that these vessels were actually faster given the same man power.

As seen in Figure 26, a mosaic located across the chapel, several rows of straking, along with their nailing pattern, are carefully delineated.

The port steering rudder on the closer ship is visible in this mosaic. It is mounted through a box-like structure like that seen in two of the 6th-century vessels in the Port of Classe mosaic, Figure 8 A and Figure 8 C.




**Figure 27** *Translatio* of St. Isidore: The Doge Michiel and the Priest Cerbanus Arrive in Chios, mosaic (ca. 1350), north wall, left of window, San Isidore Chapel, San Marco.

Figure 28

| | |
|---|---|
| Theme: | *Translatio* of St. Isidore: the Saint's Body is Embarked.[27] |
| Cartoon Artist: | Paolo Veneziano (Muraro, 1970: 27). |
| Location: | North wall of San Isidore Chapel, right of window, San Marco, Venice. |
| Date: | ca. 1348-1355 (Muraro, 1970: 26). |
| General type: | Medium-large round ship (Type IIIb). |
| View: | Profile of starboard bow. |

This mosaic portrays the retrieval of St. Isidore's relics from a church of Chios, and implies the subsequent loading onto the Venetian merchant ship depicted to the left. The vessel is very similar to the round ship in the St. Isidore *vita* sequence located across the chapel (Figure 26), but only the bow area is depicted in this image. At the starboard bow, a gangplank has been set to shore. The sail is shown furled, and the yard securely stored high upon the mast. Four shrouds, two to port and two to starboard, are evident, and tack and vang have also been depicted, tied off firmly to port. Three turns of rope at the head of the mast may represent a rope parrel. Wedges around the foot of the mast, a crow's-nest at its top, and a hawse hole in the visible starboard bow are clearly featured.

As in Figure 26, every other strake is extra-wide, and affixed to the frames within by regularly-spaced nails. The strakes run parallel, until the bow, where they finish at the stem. The only other feature of note is the shape of the bow in profile: The sheer strake rises gradually toward the stem, but then abruptly runs horizontally to finish. This unusual bow design appears repeatedly in round ships of all sizes in this sample (the figs. on pp. 114, 121, 135, 165, 170, 177, 199, and 202), and probably indicates the presence of a foredeck and a fuller bow.

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[27] *Titulus: QV ALT COPRBMI ISIDORI DEI CUE SIA SMARCICVMASIMH BEVERENCIA APORTATVR* (Kaftal, 1978: 430).



**Figure 28** *Translatio* of St. Isidore: The Saint's Body is Embarked, mosaic (ca. 1350), north wall, right of window, San Isidore Chapel, San Marco.

Figure 29

| | |
|---|---|
| Title: | Enamel panel from the *Pala d'Oro*. |
| Theme: | *Translatio* of St. Mark.[28] |
| Artist: | Gianpaolo Boninsegna? |
| Location: | Altar, San Marco, Venice. |
| Date: | ca. 1105 (Kaftal, 1978: 670; Gauthier, 1972: 65). |
| General type: | Small round ship (Type IIIa). |
| View: | Starboard side, slightly from above. |

The *Pala d'Oro*, the famous gold, enamel and bejeweled altar of San Marco, was commissioned shortly before 1105. It was initially executed by Byzantine artists with Venetian collaboration, and incorporates enamels of various periods. It includes many enamels taken later as booty from the Church of Pantocrater monastery in Constantinople. The present altar is believed to have been redesigned by Gianpaolo Boninsegna in about 1345 to display the enamels recently acquired as booty (Lorenzetti, 1982: 189).

The bottom right *cloisonné* enamel on the screen, one of the original enamels, depicts the Marcan *translatio*, a scene of the ship at sail. Four flamboyantly dressed figures aboard include mariners at bow and stern, and two men amidships, the Venetian merchants of the legend. The representation is stylized and not rendered in true perspective, perhaps partially due to artistic conventions. The hull is unrealistically walnut shaped and the three figures to the left have been placed in an implausible position to the outside of the starboard sheer strake, that is, they appear to be located as being outboard of the ship.

The single mast is set far forward, only 3 to 4 degrees off vertical. The lateen sail is attached to its yard with stylized robands, and is decorated with two green crosses. Other rigging details have also been generalized. The mariner to the far left works the starboard vang, but both port and starboard vang are rigged via tackles which have been indicated simply as a curved line, and bow lines and at least one tackle are evident as well. Shrouds are shown running beneath the yard. For sailors to tack a lateen-rigged ship, however, shrouds in reality must have been fixed above the parrel. The halyard has not been represented, but must have passed through the clearly depicted hook-like mast head. The hook shape of this mast head would have kept the halyard as far forward of the mast as possible, to allow the unfettered movement of the yard necessary for tacking. According to Bonino, this perfection of the masthead had occurred by the 9th century, but continued to

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[28] *Titulus: HIC DEFERTUR CORPUS SCI MARCI* (*SCI* = *SANCTI*; "Here is transported the body of St. Mark.")



Figure 29 *Translatio* of St. Mark, enamel panel of the *Pala d'Oro*, altar screen, San Marco, ca. 1105 (Courtesy of the Procuratore di San Marco).

evolve, and by the 14th century, had become a simple "groove at the top of the mast where the rope for the halyard ran (Bonino, 1978 A: 49)."

Since only a few waves are indicated against the hull itself, the full shape of the rockered keel is revealed. Strakes are shown running parallel to the keel partway along the hull. The strakes converge slightly to fit into the bow and stern. A few overly-large nails are represented, but are so sparsely and sporadically placed that they are obviously intended to indicate only the joining technique and not an actual nailing pattern.

Two tine-like posts flaring out at the stern may be merely decorative. This is unlikely, however, in view of numerous other ship representations such as Figure 13, Figure 18, Figure 20, and Figure 21, where these features appears to be the continuations and terminus of important structural timbers (either the uppermost wales or sheer strakes) originating from both port and starboard. The unnatural, twisted perspective at the stern allows part of the inside of the vessel to be seen, revealing transverse planking filling in the area between the port and starboard tine-like posts. The area between the tine-like posts, then, was filled in with planking to form a flat-ended stern. These two posts may therefore be indicative in all similar representations of some sort of transom stern.

The broken band shown running along the side of the ship may represent through beams, and indicate the existence of a lower deck, or may be a purely decorative element.

This round ship employs two elliptically-shaped steering oars at the stern, plus two slender sweeps fixed toward the bow to help it tack (Mott, 1991: 51). It is not clear how they are mounted.

## Manuscript Illuminations

Figure 30

| | |
|---|---|
| Theme: | Siege scene. |
| Artists: | Venetian school. |
| Location: | Biblioteca Apostolica Vaticana, Rome (Thubrin, 1980: 33). |
| Date: | 11th century (Thubrin, 1980: 33). |
| General type: | Four oared galleys (Type IIa). |
| View: | Starboard sides, slightly from above. |

This manuscript illumination depicts four warships temporarily joined in pairs at deck level to form makeshift siege platforms, as Villehardouin described was done during the 4th Crusade (Marzials, 1965: 60-61):

> ...the ships that carried the scaling ladders should be bound together, two and two, so that two ships should be in case to attack one tower; for they had perceived that day how only one ship had attacked each tower, and that this had been too heavy a task for the ship, seeing that those in the tower were more in number than those on the ladder.

These platforms were completely reconstructed for each engagement (Dolley, 1949: 52). Two uprights on each ship represent its two masts, both shown as being set completely vertically, although, presuming a lateen rig, the foremast would have had to incline forward. I believe the vertical orientation of the foremast must be an artistic error, and the vessels were, in fact, two-masted lateeners. Spars were probably used to form the temporary bridge (Marzials, 1965: 70).

Each vessel is simply depicted as a double-ended hull with a minimal amount of detail. The keel seems to be slightly rockered. Both posts curve inward, flaring like the stems and sterns of Figure 10 and vessels in 12th century mosaics of Monreal Cathedral in Sicily (Moll, 1929: figs. 123-125). An enigmatic wing-shaped feature (not shown in any other image in this catalog) is conspicuous in the three quarter view of the stern. Transverse along the inward-curving stem, a pole projects from port and starboard. Connected to it at either side are two semi-triangular sections. If these triangular parts were able to fold down, the depiction of this stern would resemble the sterns which are specifically discussed in various other depictions, such as Figure 23, Figure 25, and Figure 40, which I believe relate in some way to a triangular rudder mount system. The function of this stern, however, remains uncertain. Perhaps this enigmatic feature illustrates the puzzling term *ali*, which has been translated as "wings." The feature is certainly wing-like. In any case, the stern depicted here is distinctly different from the other transom-like sterns put forth as possible interpretations for the term *ali*, and seems more similar to the

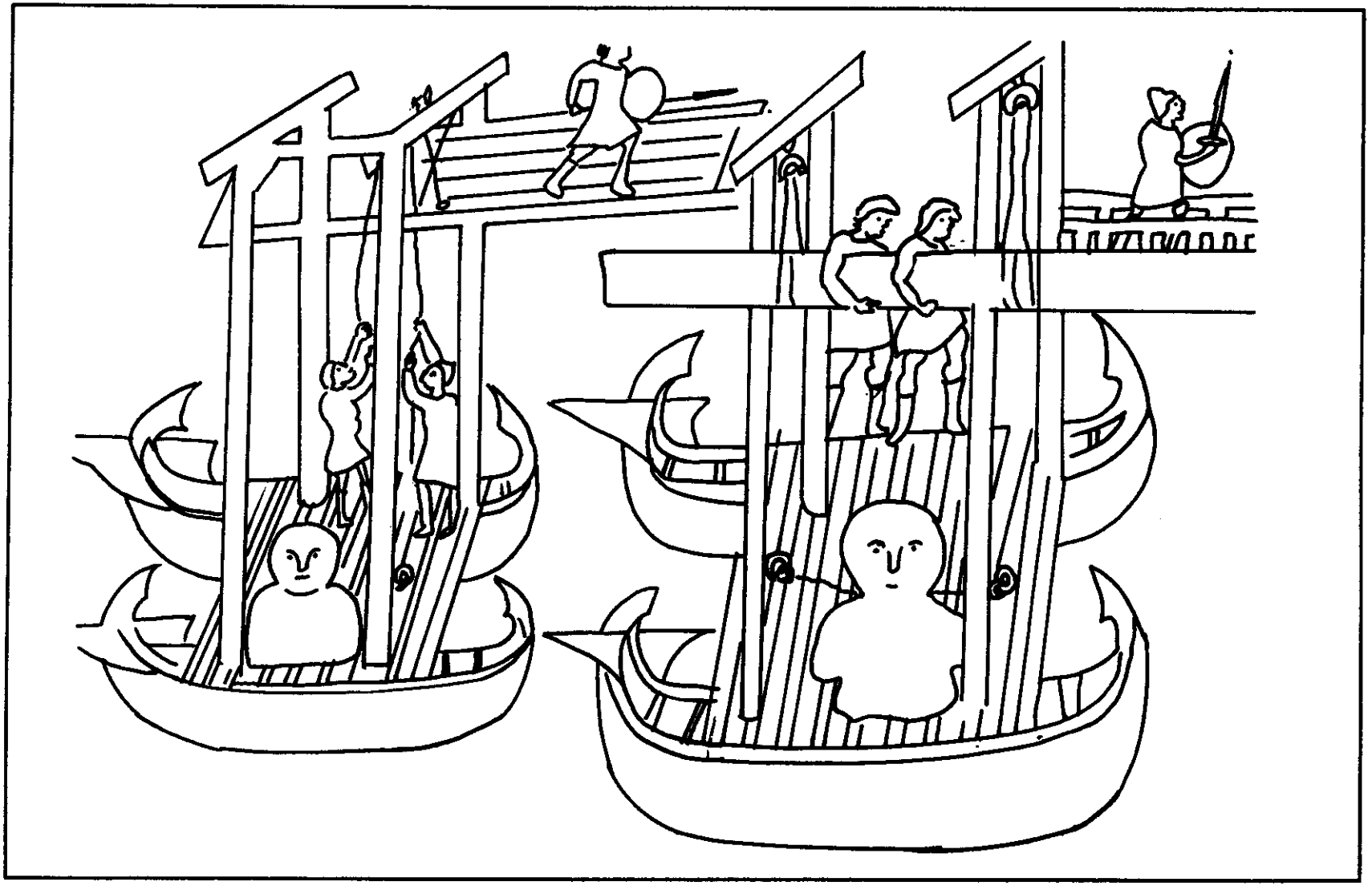


**Figure 30** Siege scene, from an 11th-century manuscript (after Thubrin, 1980: 33).

sterns interpreted as being fitted with triangular rudder mounts.

Figure 31

Manuscript title: *Oppiano (pseudo) Cynegetica.*
Artist/author: Oppianus.
Theme: Zetes and Calais Pursue the Harpies (Weitzmann, 1951: Pl. XLI).
Location: Biblioteca Nazionale Marciana, Venice, Gr. Z. 479 (=881), folio 39$^{v}$.
Date: 11th century (Bettini, 1974: 39).
General type: River cargo boat (Type Ie).
View: Starboard side, slightly from above.

This Greek treatise on hunting and fishing preserved in the Biblioteca Nazionale Marciana in Venice contains six manuscript illuminations of vessels. Three of the representations (including Figure 32) are small fishing craft (Type Ic), one (Figure 31) is a river cargo boat (Type Ie), and two (Figure 33) are oared galleys (Type IIa). The manuscript is a product of renaissance Macedonian book-making, and copies earlier poems (Bettini, 1974: 39). Several illustrations in it are worthy of consideration, since they exemplify the mid-Byzantine style (Figure 31, Figure 32, and Figure 33). Two other folios of this manuscript (not reproduced here) depict double-ended fishing boats. One of these shows three fishermen night fishing. A bulbous light (labeled in Greek, *fanos*) affixed to the bow of the vessel was intended to attract numerous fish.

Figure 31 is a depiction of the mythological scene of Zetes and Calais pursuing the harpies. It shows a typical portrayal in the Byzantine style of a small lateen-rigged vessel.

The single vertical mast is set in the bow, but too close to vertical for a lateen-rigged vessel, although the sail shape is clearly triangular. The lines defining the sail probably indicate that it was made up of rectangular sections. The yard is tilted the wrong way, an error which may be due to artistic license: perhaps the artist was creating space for the harpies. Other inaccuracies are seen in the rigging: three lines leading far aft from the *cares*, represent the bowlines and the *mulgaranus*, which would be secured in the bow. A halyard is visible on the forward side of the mast. No shrouds or stays have been represented.

The keel seems slightly rockered. The flaring stem curves strongly inboard to finish (like Figure 10 and Figure 30), while the sternpost rises gradually, flanked by two continuations of structural longitudinal timbers to port and starboard. The most interesting feature of the image is the stern. The two uppermost wales do not come to a point where they would have joined the sternpost. Instead, the



Figure 31 An 11th-century manuscript illumination of Zetes and Calais pursuing the harpies, from *Cynegetica*, fol. 39$^{v}$, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

three timbers form a transom stern in which each timber is finished off with a decorative finial. Lines of straking are vaguely discernable.

Figure 32

Manuscript title: *Oppiano (pseudo) Cynegetica.*
Artist/author: Oppianus.
Theme: Fishing scene.
Location: Biblioteca Nazionale Marciana, Venice, Gr. Z. 479 (=881), folio $2^{R}$.
Date: 11th century (Bettini, 1974: 39).
General type: Small fishing boat (Type Ic).
View: Starboard side, slightly from above.

This illumination depicts two men rowing a small boat near a man ashore, who is line fishing. The boat's details are minimal. It is relatively flat bottomed, with an inward curving, pointed bow. The most significant feature is the depiction of the inner frames visible at the stern, which appear to form a flat transom stern. The more visible paddle is elliptical in shape; the man in the bow seems to be punting.

Figure 33

Manuscript title: *Oppiano (pseudo) Cynegetica.*
Artist/author: Oppianus.
Theme: Mock naval battle (*Naumachia*).
Location: Biblioteca Nazionale Marciana, Venice, Gr. Z. 479 (=881), folio $23^{R}$.
Date: 11th century (Bettini, 1974: 39).
General type: Two oared galleys (Type IIa).
View: Starboard profiles.

These two galleys, engaged in battle, have respectively eight and ten oars per side. A large, symmetrical steering oar is clear on both vessels visible sides. The Byzantine stylization of the illumination has resulted in few worthwhile details. The bow and sterns are inward curving at their ends, with the stern slightly higher than the bow. *Naumachia* is written in Greek above the scene (Weitzmann, 1951: Table XXXVIII, fig. 134).



**Figure 32** An 11th-century manuscript illumination of a fishing scene, from *Cynegetica*, fol. $3^{R}$, of the Biblioteca Nazionale Marciana (Courtesy of the Library).



**Figure 33** A naval battle from the 11th-century manuscript, from *Cynegetica*, fol. 23$^{R}$, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

Figure 34

Manuscript title: Lectionary.
Theme: Christ dismissing the multitude.
Location: Church of Giorgio dei Greci, Venice, lectionary, folio $63^{RO}$.
Date: 11th century (Princeton Art Index catalog).
General type: River cargo boat (Type Ie).
View: Starboard profile.

The boat in this illumination, particularly its tine-like, prong shaped stern, is the typically stylized small boat of Byzantine art, and details are predictably minimal. The hull is double-ended, with a rounded hull and inward curving posts. Its most interesting feature is the hook-shaped mast head, equivalent to that seen in Figure 29, of the *Pala d'Oro*.

Figure 35

Manuscript title: Lectionary.
Theme: Disciples fishing.
Location: Church of Giorgio dei Greci, Venice, lectionary, folio $98^{RO}$.
Date: 11th century (Princeton Art Index catalog).
General type: Small fishing boat (Type Ic).
View: Starboard profile.

Like Figure 31 and Figure 34, this illumination is the formalized Byzantine conventional rendition of a small craft. The hull appears rounded, and the stem and sternposts both curve inboard sharply. The stem has simplified tine-like prongs. An upper wale projects beyond the bow area. The boat probably could have been fitted with a mast when required.

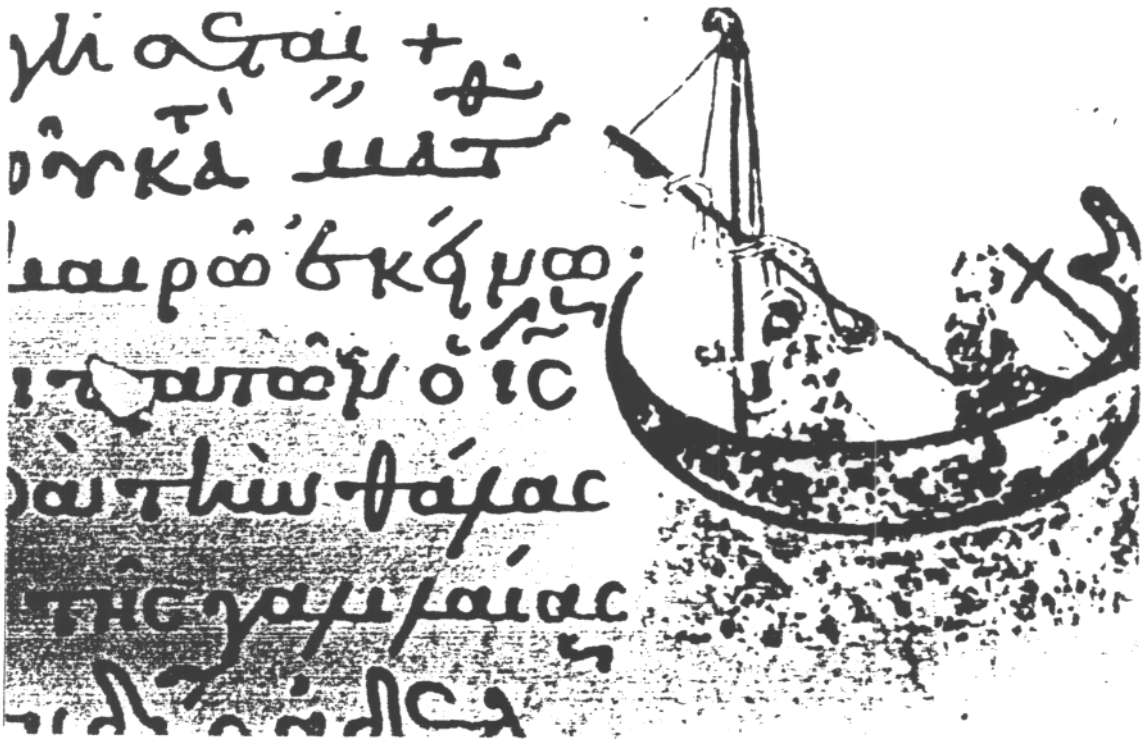


**Figure 34** Christ Dismissing the Multitudes; scene of lateen-rigged boat, from an 11th-century lectionary from the Church of Giorgio dei Greci, Venice.



**Figure 35** Disciples fishing from a small boat, from an 11th-century lectionary from the Church of Giorgio dei Greci, Venice.

Figure 36

Manuscript title: *Liber ad Honorem Augusti*.
Artist/author: Pietro di Eboli (from Eboli, near Salerno).
Theme: The Empress Constance is carried by galley from Salerno to Messina, Sicily.
Location: Manuscript of Pietro of Eboli, location unknown (Bragadin, 1974: 28).
Date: 1195 (Anderson, 1962).
General type: Bireme oared galley (Type IIa), a dromon.
View: Starboard profile.

Although this rare portrayal of a 12th-century warship was made in southern Italy and not the Veneto, it is included in the catalog since so few Venetian examples of galleys exist from such an early date. It is not, however, incorporated in the typology developed in Chapter IV.

No masts or sails are portrayed in Figure 36, but seventeen oars are shown on the starboard side, divided into eight oars on an upper level, and nine through ports below.

The hull bottom might be hidden by the water, but if not, it is completely flat. A main wale and the sheer strake run parallel to it. The main wale continues horizontally, projecting from the bow, forming the boarding bridge, or *sperone*, in Venetian. The stem rises in a straight line from the keel at about 45 degrees, then curves inboard, flaring to finish like the stem seen in the mosaic of Figure 14. At the stern, two inward-curving, tine-like posts, resembling those of Figure 13, may indicate the exterior frames of a squared-off, transom-like stern. These posts rise from the keel at about 45 degrees, and curve inboard, but in a gradual curve from the keel upward. The presence of Empress Constance seated under an ample tent in the extreme end of the stern also implies that the stern was square-ended. If it were double-ended, there would be no room for a tent, nor for a person to sit so far aft. Facing her, from a few feet forward, coxswains maneuver the two paddle-like quarter rudders.

An outrigger runs the full length of the ship; this detail reflects the first of a two-step development in warship design that developed toward the end of the 13th century, as explained in the discussion of Figure 27. The example here shows a warship where the level of both banks of oarsmen is raised. Oarsmen are seated on two levels. Oars of the lower level of oarsmen pass through portholes just above the main wale of the galley. According to Casson (1964 B: 72), a further development occurred at the turn of the 14th century, with the *zenzile* arrangement illustrated in Figure 27. The oarsmen, sitting at one level far inboard in a lower hull, worked their oars in pairs or groups of threes on the same bench with all their oars pivoted on the outrigger. The lower hull, with fewer decks, proved to be less top-

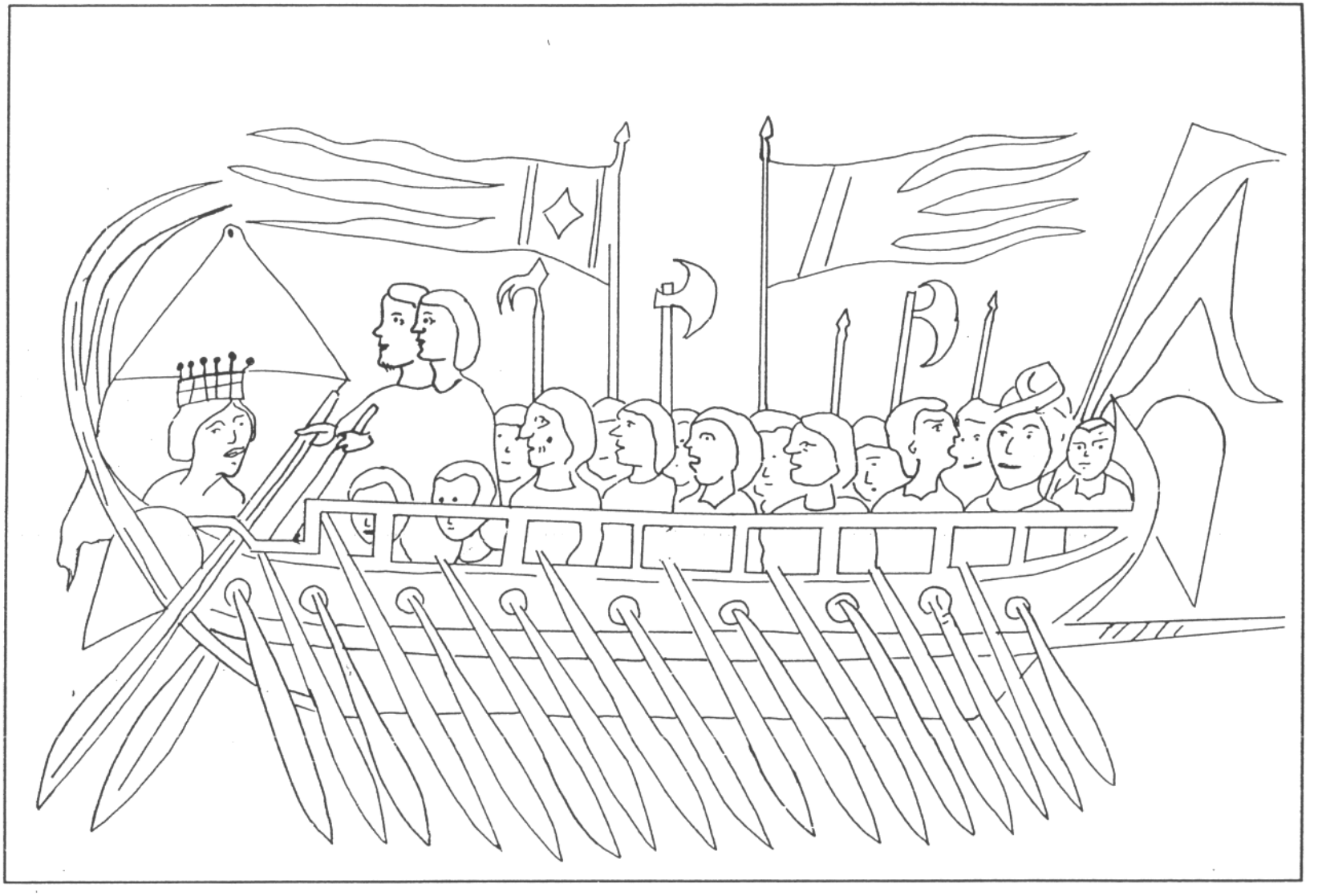


**Figure 36** A dromon or bireme galley under oars, from the 12th-century manuscript, *Liber ad Honorem Augusti* by Pietro di Eboli (after Bragadin, 1974: 28).

heavy and therefore more seaworthy. All Venetian long ships from the 13th century until the mid-16th century were of the *a zenzile* variety (Rubin de Cervin, 1985: 31).

A variety of fighting axes, javelins, spears and pennants are shown standing upright in the center of the warship.

Figure 37

Manuscript title: *Capitolarium Nauticum pro navis.*
Theme: Maritime codes.
Location: Biblioteca Querini-Stampalia, Venice, Cl. IV, cod. I (=147), folio 77.
Date: 1255 (Lane, 1973 B: 47).
General type: Large round ship (Type IIIb).
View: Starboard side, slightly from stern. Bow area viewed slightly from above (twisted perspective).

This merchant ship illustration decorates the top half of an illuminated initial "S" in a copy of Zeno's *Statuta navium*, maritime codes which applied to two-decked round ships ranging in carrying capacity from 200 to 1000 *milliaria*. A mizzen mast is set slightly aft of midship, while a foremast is set in the bow. Both lateen sails are furled on their yards which remain hung upon their respective masts. Each mast supports a large crow's-nest centered at its top, as seen in Figure 10, Figure 12, Figure 13, Figure 14, and Figure 15 of the 12th century. Pulleys, stays, two to three shrouds per side, vang and tack are delineated.

The ship's bow area is shown to be full and rounded. The stern is slightly higher and is clearly flat-ended as a transom stern. Two substantial upright beams originating low in the hull and passing perpendicularly to a heavy horizontal beam approximately at the poop's deck level (representing the *trigànte*), are obviously structural, and form the outer sides of the squared transom stern. These upright beams are perhaps the continuations of water line wales. Below the heavy horizontal beam in the stern area, planking runs vertically, parallel to the two upright beams. Above this beam, the horizontal fill planking are set. A light parapet, probably of rope, runs along the perimeter of the quarter-deck area. Three vertical poles of differing heights project from the poop. The one to starboard displays a pennant.

The twisted perspective at the bow reveals regularly spaced inner framing at the bow. The arms of two quarter rudders project through holes near the ends of the sides of the vessel. A large-fluked anchor is catted up at the bow, in reverse from the usual position depicted: crown forward.

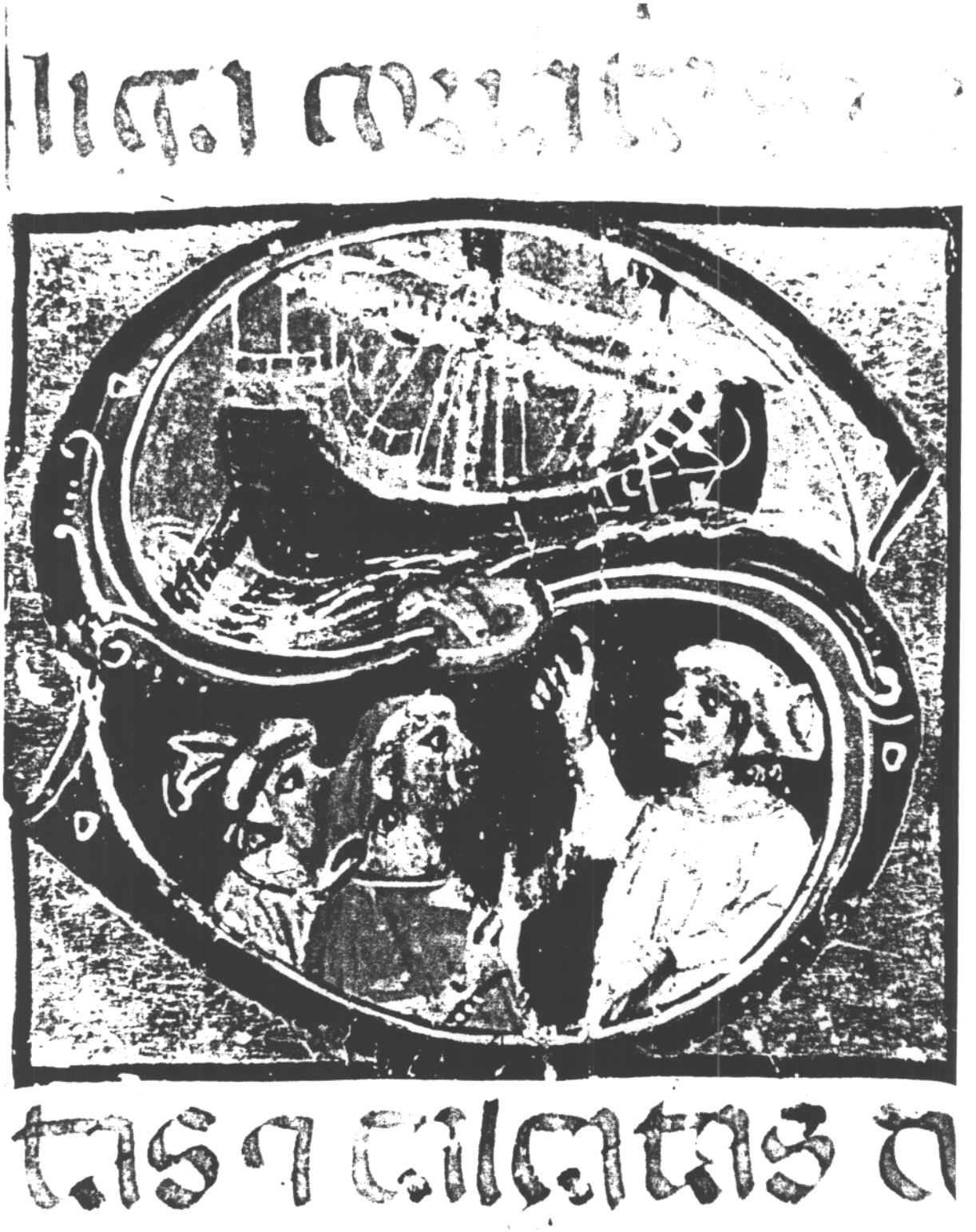


**Figure 37** Round ship decorating an illuminated initial "S," from a copy of the Maritime Code of 1255 in the Biblioteca Querini-Stampalia (Courtesy of the Library).

Figure 38

Manuscript title: *Secreta fidelium Crucis*.
Author: Marino Sanudo (Torsellus).
Theme: Handbook for Crusaders.
Location: Bodleian Library, Oxford, MS. Tanner 190, folio $22^{R}$.
Date: 1321-1324 (Pächt and Alexander, 1970: 118).
General type: Oared galley (Type IIa).
View: Starboard profile.

This small galley is propelled with thirteen oars per side, all arranged on the same level. Its flat-ended transom stern differs dramatically in shape from its slightly pointed bow. Along the sheer strake, a balustrade or possibly an outrigger runs the length of the vessel. Five crossbows are stored, ready for use, pointed upwards in a yellow box amidships, while javelins are stowed in the bow and stern areas. Pennants fly at both bow and stern. The helmsman holds the loom of the starboard rudder, which passes through a hole in the side of the hull.

Figure 39

Manuscript title: *Secreta fidelium Crucis*.
Author: Marino Sanutus (Torsellus).
Theme: Handbook for Crusaders.
Location: Bodleian Library, Oxford, MS. Tanner 190, folio $20^{V}$.
Date: 1321-1324 (Pächt and Alexander, 1970: 118).
General type: Oared galley (Type IIa).
View: Starboard profile.

This small galley is similar to that of Figure 38. It is being rowed with twelve oars per side in one level. The stern of this vessel is more rounded and slightly fuller than that of Figure 38. The main wale and an uppermost wale or sheer strake continue horizontally to form a *sperone* projecting from the bow. Above are the stem and apron. Pennants fly at both bow and stern. The vessel's helmsman controls a quarter rudder from the small quarter-deck. The gilded triangular area at the stern, probably part of the rudder mount system, is similar to that described for Figure 23, Figure 25, and Figure 26, but here is higher in the hull. Javelins or arrows are stored vertically along the whole length of the vessel (also seen in Figure 36 and Figure 38).

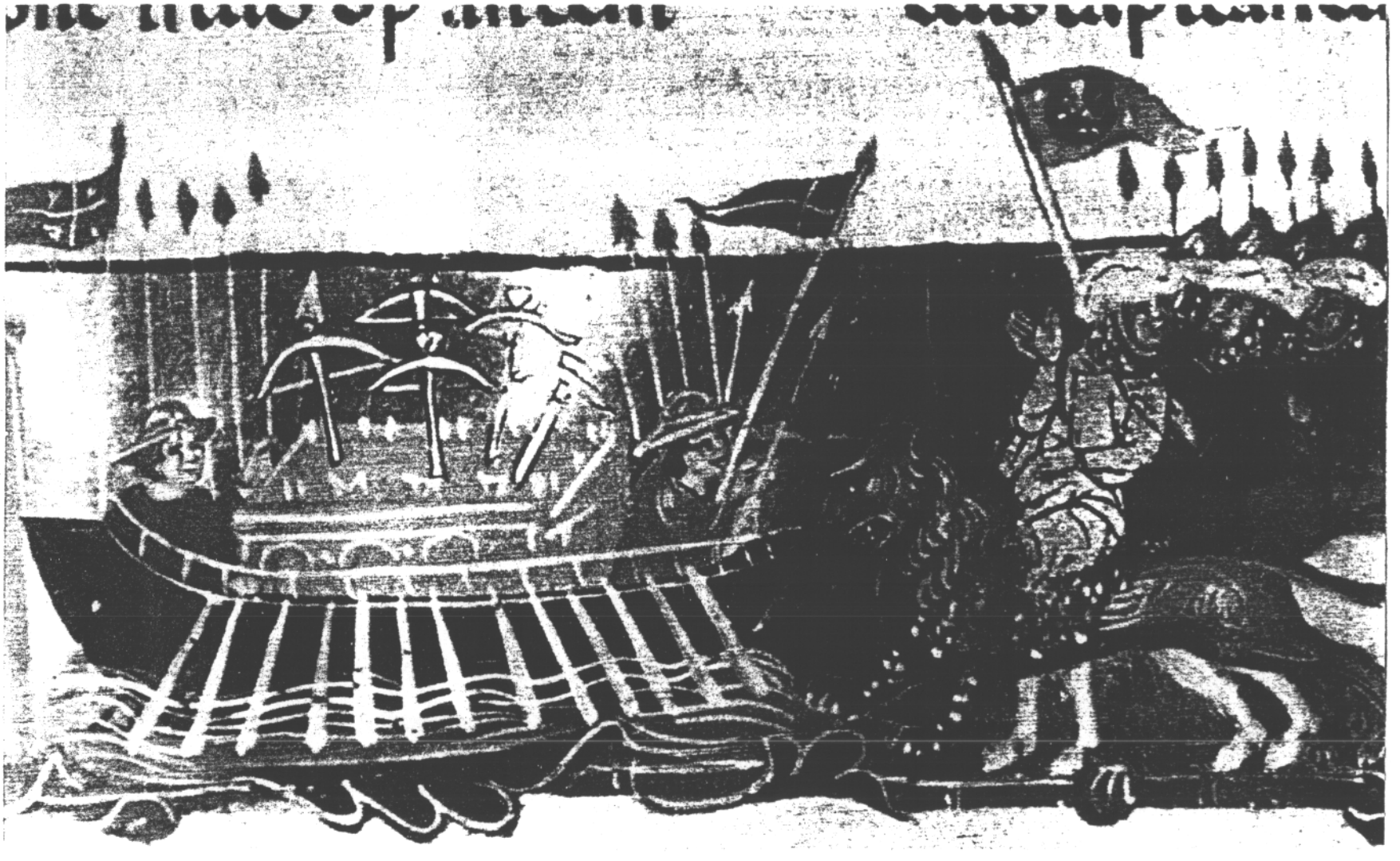


**Figure 38** Departure of oared warship, from the manuscript *Secreta fidelium Crucis* (1321-1324) of the Bodleian Library (Courtesy of the Library).



**Figure 39** Oared warship, from the manuscript *Secreta fidelium Crucis* (1321-1324) of the Bodleian Library (Courtesy of the Library).

Figure 40

Manuscript title: *Secreta fidelium Crucis.*
Author: Marino Sanutus (Torsellus).
Theme: Handbook for Crusaders.
Location: Bodleian Library, Oxford, MS. Tanner 190, folio $17^{v}$.
Date: 1321-1324 (Pächt and Alexander, 1970: 118).
General type: War transport (Type IIb).
View: Starboard profile.

A two masted, lateen-rigged transport ship is shown being loaded in preparation to sail. Vang and tack are visible only on the foresail. The vang is apparently being used to maneuver stores on board. The vessel is comparable to the ships of mosaics in Zen Chapel and on the original facade of San Marco (Figure 23 and Figure 25). Note the general shape of the hull and the gilded triangular area at the stern, which may be part of a rudder mount type more clear in Figure 26 and perhaps Figure 30.

Figure 41

Title: The Pizzigani Portolan.
Theme: Marine chart with Genoese and Venetian ships.
Location: Present location of portolan unknown; published in Zanetti (1841: 38, fig. 1) and Lane (1973 B: 121, fig. 8).
Medium: Ink drawings from portolan map.
Date: 1367 (Lane, 1973 B: 121 and fig. 8).
General type: Large round ship (Type IIIf).
View: Starboard side, viewed slightly from bow.

The published illustrations from this portolan contain two mixed-rig cogs. From the flags, the right one is recognizably a Genoese ship, while the one to the left is a Venetian vessel. Both exemplify the transitional rig where the square main sail provides the maximum driving force, the lateen sail aft improves its ability to sail into the wind, and a spritsail hung on the bowsprit would help the main sail keep its shape.

The Venetian ship's mainmast employs a square sail, the shorter mast aft, a lateen sail. The square sail consists of a series of squares; the lateen sail has parallel vertical lines. These lines probably indicate the shape of the sections of sail cloth sewn together for each sail type.

The representation is difficult to interpret at the bow. What may be either the forestay of the mainsail or the bowsprit mast have been similarly represented as a pair of lines with evenly spaced cross-marks. The true function of these features is difficult to ascertain, although they probably represent the mizzen's forestay rigging line and the spritsail's mast. Rigging lines with their blocks are visible on the



**Figure 40** Transport ship under sail, from the manuscript *Secreta fidelium Crucis* (1321-1324) of the Bodleian Library (Courtesy of the Library).

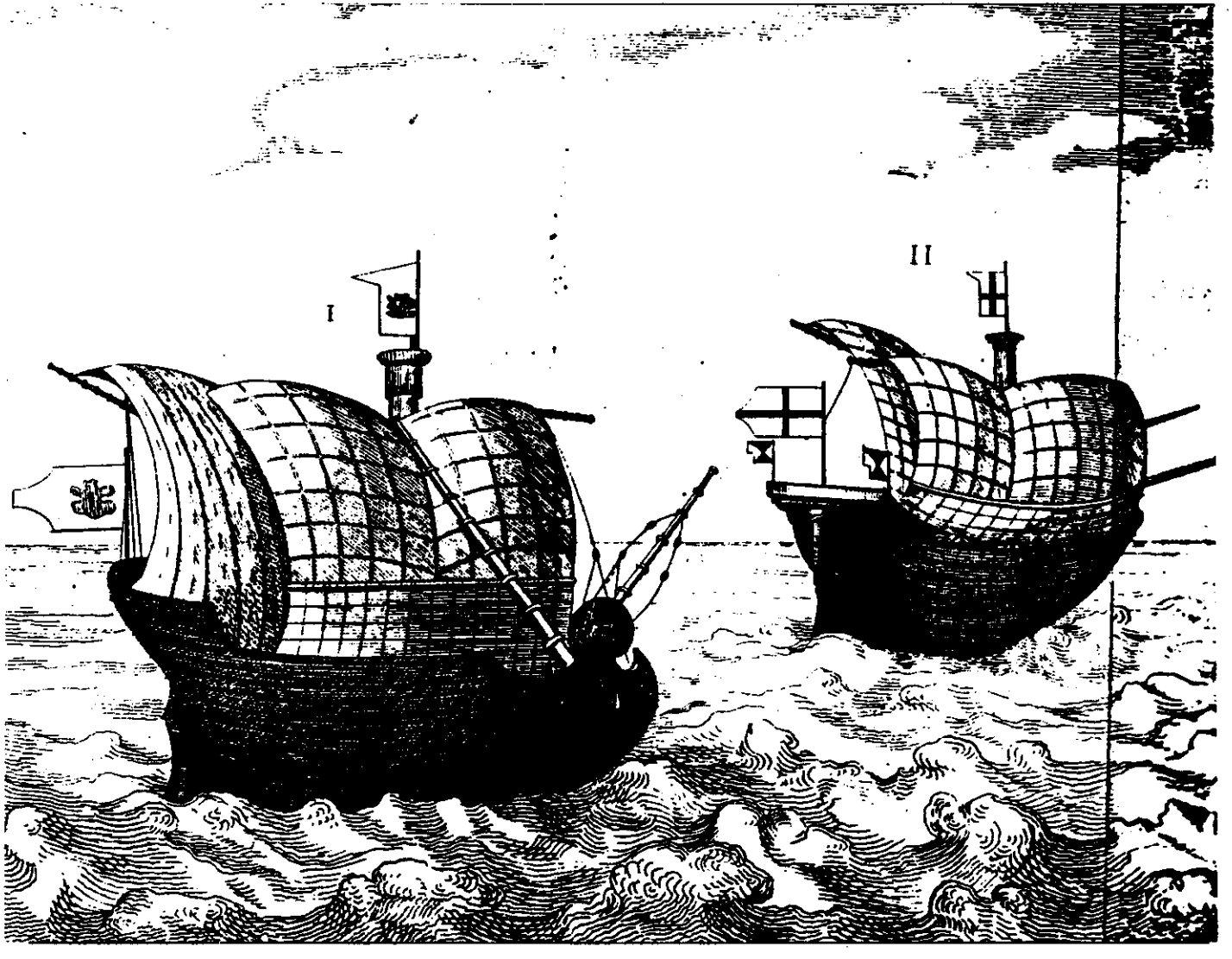



**Figure 41** Venetian (left) and Genoese (right) ships, after the Pizzigani portolan dating from ca. 1367 (Courtesy of the Museo Storico Navale).

bowsprit as are a brace of the main sail and the vang of the after mast's sail.

The sheer strake of this vessel swoops lower just before the stem. Rows of straking are set with a single line of equally spaced nails.

Figure 42

Manuscript title: *Roman de Troie.*
Theme: Story of the Trojan War: ship entering port.
Location: Biblioteca Nazionale Marciana, Venice, cod. marc. Fr. Z. 17 (=230), folio 21$^{v}$.
Date: Early 14th century.
General type: Small round ship (Type IIIa).
View: Starboard side, viewed slightly from bow.

This lateen-rigged round ship carries five unrealistically-large men, at least three of whom are mariners. One works the quarter rudder at the helm, while others manage the rigging. The single mast is set far forward, where it is supported by six shrouds or stays. A cylindrical crow's-nest sets aft of the masthead. The visible robands seem to be ties of rope. The vang and tack and respective block tackle are clearly represented. The vang is secured at the stern. The tack is being hauled by the mariner at the bow, while the sheet is held by a man amidships.

As for the hull, its shape is full at both bow and stern, although at the stern, a small rectangular decked area exists while the bow is apparently pointed and undecked. Several ends of beams supporting the main deck are indicated in the visible starboard side. Details of the planking are obscure. The depiction of the uppermost planking, along with Figure 15, provides confirmation for the existence on at least some merchant round ships of a removable sheer strake tangibly exemplified in the Contarina ship (ca. 1300), where it slid aside in a specially cut groove (see discussion, p. 225). The section was probably moved in preparation for disembarkation or loading.

Although difficult to make out clear details, the quarter rudder seems to be mounted through a yoke, with the aft type mount similar to that seen in the following figure, Figure 43. A crescent-shaped anchor is catted up at the starboard bow, crown toward the stern.

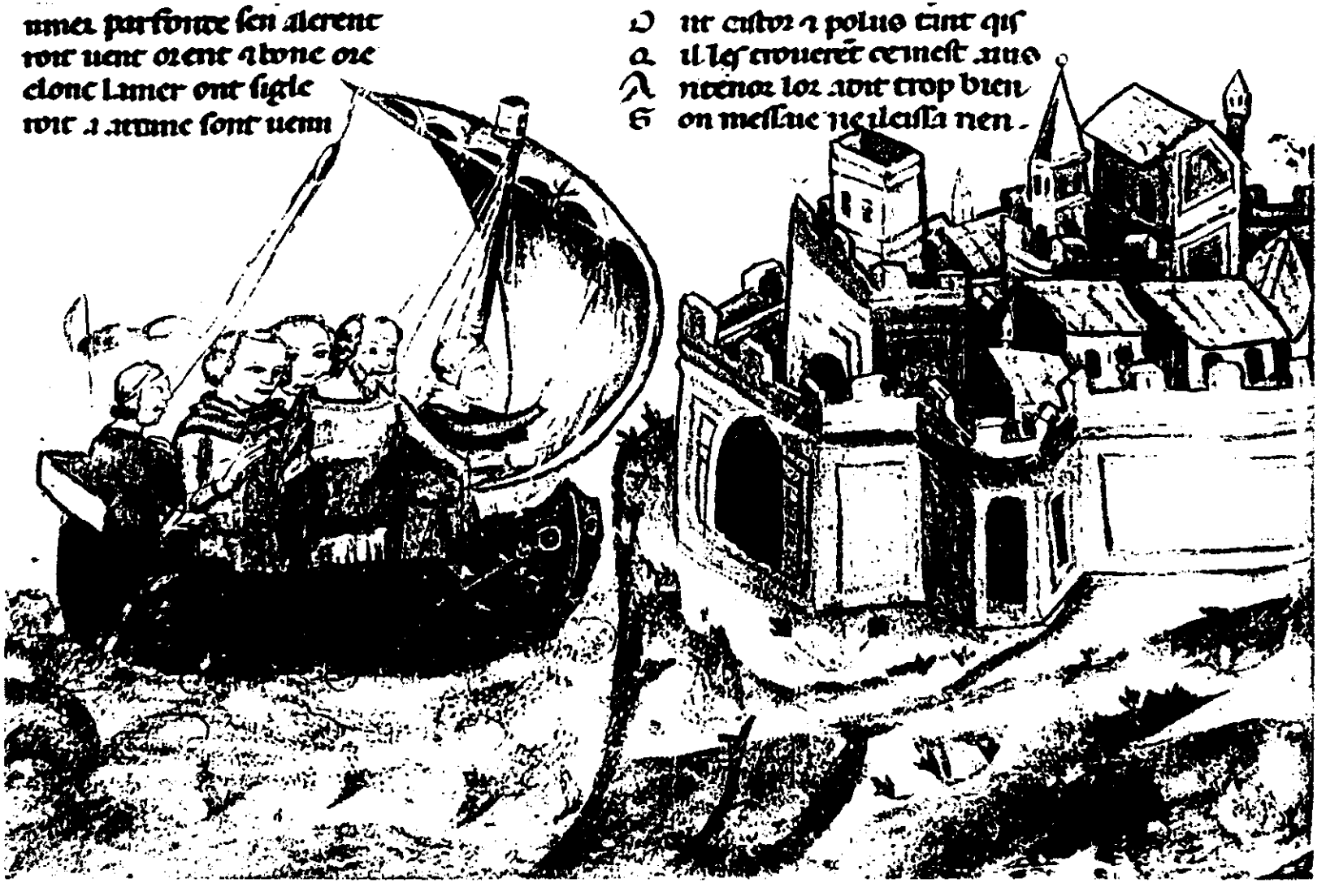


Figure 42 Round ship entering port, from the 14th-century manuscript, *Roman de Troie*, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

Figure 43

Manuscript title: *Roman de Troie.*
Theme: Story of the Trojan War: ship at storm.
Location: Biblioteca Nazionale Marciana, Venice, cod. marc. Fr. Z. 17 (=230), folio $22^{v}$.
Date: Early 14th century.
General type: Medium-large round ship (Type IIIb).
View: Port side, viewed slightly from the bow and above.

This illustration portrays a large lateen-rigged vessel caught in a storm. For emphasis, the figures have been made unrealistically large. The foremast, set far forward in the bow, has snapped in half, and a mariner desperately tries to control its lateen sail. A second mariner in the stern deals with the sail of the mizzen mast slightly aft of midships. The robands of both sails are represented. On the mizzen mast sail several lines of rigging, generically indicated, can be seen, including shrouds, halyards and the vang, as well as their tackle; on the foremast, the upper section of the halyard and sheet are shown. An upper detail on this mast also constitutes, significantly, a rare medieval representation of the parrel, which attached the yard to the mast. Here it consists of a strand of wooden beads to reduce friction between the yard and the mast, thus facilitating the yard being hauled up and down the mast. Its tackle (*anchus*) allowed the yard to be tightened to or loosened from the mast.

The general shape of this vessel is reminiscent of that in the figure on page 187, with its gilded finials decorating the bow and sterncastle. These may be what is depicted on the stern of Figure 31, and certainly in Figure 13 and Figure 85, where these decorative balls are all along the sheer strake.

The stern does not end in a point as does the bow; rather, the stern has been broadened and made transom-like with two outer timbers which apparently end at the tragent beam perpendicular to the central sternpost. Because of the angle shown, the inside of the squared-off transom stern is apparent with its view of the small arched quarter-deck.

The loom of the foil-shaped quarter rudder has been attached aft of a through beam and mounted through a *luctatorium*, which, according to Pryor, was "a metal ring fixed to the hull [that] served to keep the oar buffered from the hull but fixed close to it and yet sufficiently far out to permit freedom of movement for the blade (Pryor, 1984, no. 3: 282)." The rudder has an asymmetrical foil-design blade astern of the loom, similar to one depicted in the manuscript, *Fabrica di galere*, on folio $13^{R}$; fig. L on p. 266). A crescent-shaped anchor is catted up at the port bow, crown slung aft, with its hawser passing



**Figure 43** Round ship caught in a dangerous storm breaks its foremast (note the parrel), from *Roman de Troie* (14th century) of the Biblioteca Nazionale Marciana (Courtesy of the Library).

through the hawse hole very close to the stem.

Figure 44

Manuscript title: *Roman de Troie.*
Theme: Story of the Trojan War: arrival scene; anchored in harbor.
Location: Biblioteca Nazionale Marciana, Venice, cod. marc. Fr. Z. 17 (=230), folio $38^{R}$.
Date: Early 14th century.
General type: Eight medium-sized round ships (Type IIIa).
View: Port and starboard bows.

Eight single-masted ships, tied side to side while at anchor in port, are the subject of this illumination. Seven mariners are shown in various activities related to their arrival in port. The first from the right is in the process of lowering the lateen sail and coiling down; he actually holds a vang line from the yard of the ship to his left, not of the ship on which he stands. This fact, coupled with the inaccurate placements of the masts themselves, show that the representation is not accurate to the finest detail, either due to the artist's lack of nautical knowledge, or because it was a hastily made sketch. Nonetheless, certain aspects of the illustration are of interest. The fifth mariner from the left is in the process of furling his sail and tying it to its yard, the third and sixth are stowing gear, and the seventh mariner is lowering his yard. Seven of the eight vessels have a hawser tied from the starboard bow hawse hole (apparently the port hawse hole was inadvertently forgotten on the sixth from the left); the first from the left has a line running from the port hawse hole as well. All anchors are crescent shaped, and set toward the shore on the seabed. They are quite naturalistically depicted with stocks lying flat, with one of their flukes imbedded in the sea floor.



**Figure 44** Eight round ships anchored in port, from the 14th-century manuscript, *Roman de Troie*, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

**Figure 45**

Manuscript title: *Roman de Troie*.
Theme: Story of the Trojan War: shipbuilding scene.
Location: Biblioteca Nazionale Marciana, Venice, cod. marc. Fr. Z. 17 (=230), folio 26$^{v}$.
Date: Early 14th century.
General types: Two round ships (Type IIIa).
View: Starboard side, bows only.

This illustration portrays two round ships under construction (an earlier stage of ship construction is shown in the fig. on p. 175). Men work on these two vessels from below and from within; the illumination provides important details of the shipwright's tools. At the bow of the closer, more complete vessel, a shipwright or carpenter bores holes with an auger, while to his far left, another hammers nails, attaching strakes to the frames. Between them, a caulker works, filling seams. From above, to the left, another shipwright drills with an auger, the second figure employs a T-shaped axe to finish off the apron.

On the far ship, a man nails strakes to the framing, while from above, another works edges of the timbers within with a bearded axe (Goodman, 1964: 28).[29] Frames at the bow have strakes set about half way up the side of the hull, revealing a fairly consistent room-and-space. The lower strakes of this ship are shown as fixed with one row of evenly spaced nails. On the nearer ship, two rows of evenly spaced nails secure the flush-laid strakes.

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[29] The axe was the most important tool to the medieval shipwright, who used it to shape and size timbers (Singer, 1956: 389).

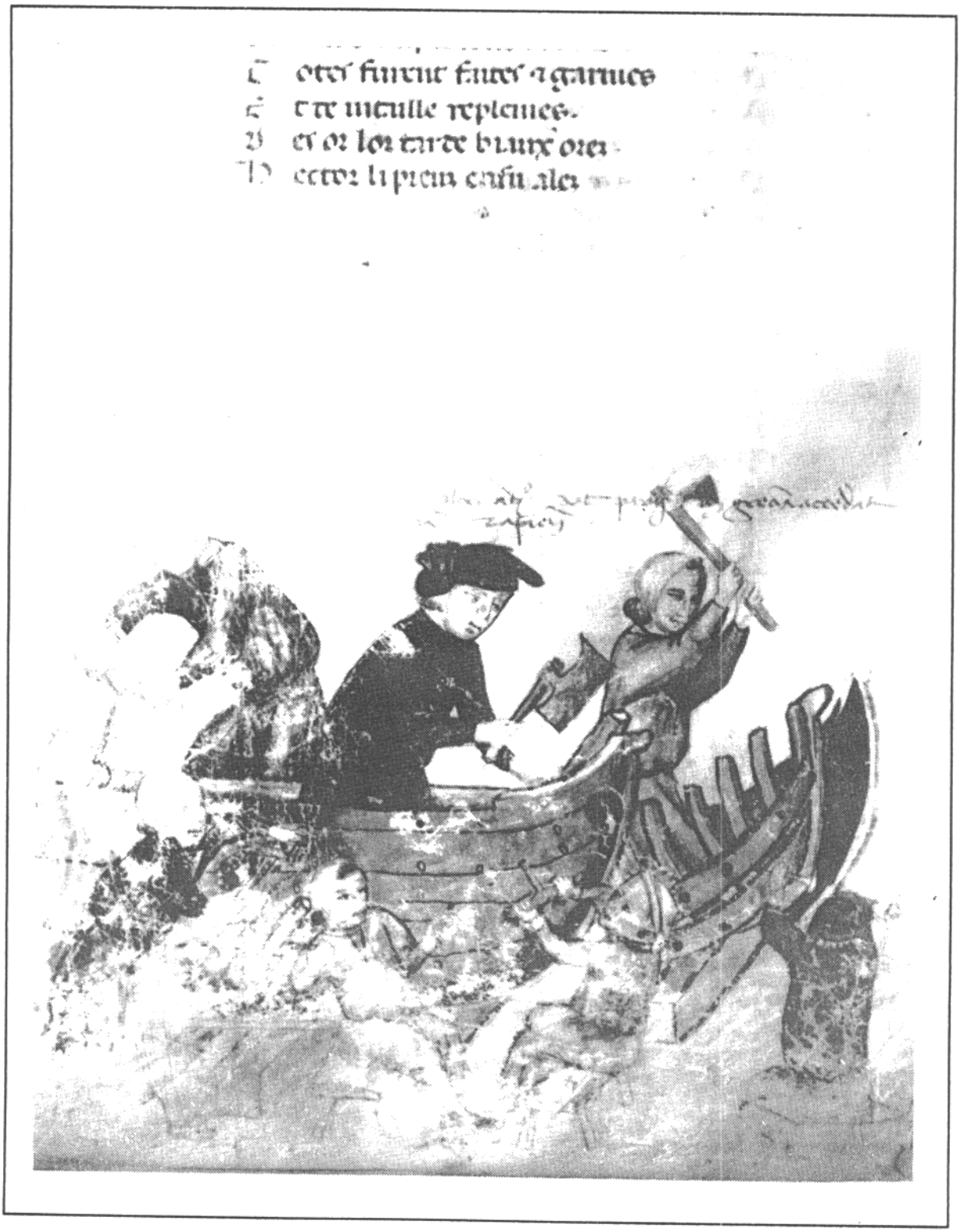


**Figure 45** Ship construction scene from the 14th-century manuscript, *Roman de Troie*, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

Figure 46

Manuscript title: *Roman de Troie.*
Theme: Story of the Trojan War: shipbuilding scene.
Location: Biblioteca Nazionale Marciana, Venice, cod. marc. Fr. Z. 17 (=230), folio 37$^{R}$.
Date: Early 14th century.
General type: War transport (Type IIb).
View: Port profile.

Another ship construction scene illustrated in the same manuscript as Figure 45 shows a ship which could either be interpreted as a round ship or a transport. The vessel is near completion, with all its planking attached, and a final layer of caulking being applied. Stantions and the tent structure are already set up at the stern. The continuation of the visible port sheer strake forms stantion for this tent. This is another possible function for the upright posts on medieval ships' sterns.

The vessel is not detailed enough to indicate much beyond the basic shape of the hull and the horizontal keel, although the wide range of tools employed is again informative. A worker within the bow hefts an axe. To his right, also from inside the hull, another carpenter bores with an auger, while a third trims a timber at the stern. From below, a caulker spreads pitch, taken from a heated cauldron, onto the exterior of the ship's hull, while another man works hemp into the seams with his caulking iron.

The sweep of the strakes finishing at the tragent at the stern can barely be distinguished in the vessel. As in the galleys of Figure 27 and Figure 36, there is a tented area above the quarter-deck for the nobility in command.

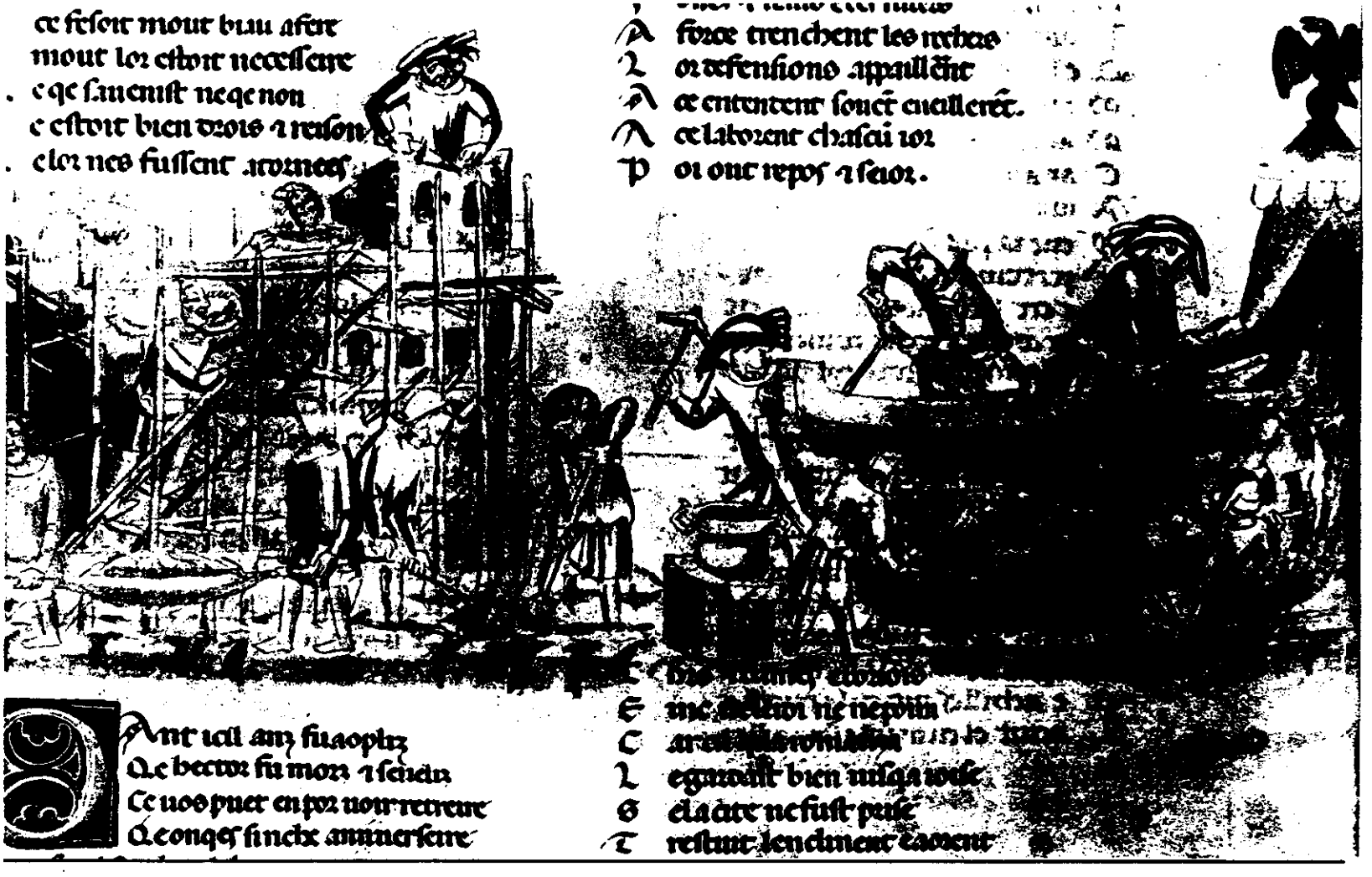


Figure 46 Ship under construction. Note the tented area at the stern. From the 14th-century manuscript, *Roman de Troie*, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

Figure 47

| | |
|---|---|
| Theme: | Martyrdom of St. Clement. |
| Artist: | Venetian school. |
| Location: | Biblioteca Nazionale Marciana, Venice, Cod. Lat. III, III. |
| Date: | First half of 14th century. |
| General type: | Small lagoonal boat (Type Ia). |
| View: | Port profile. |

Few nautical details are indicated in this depiction of a small lagoonal craft. No mast, spars, sail, or rigging are visible. The vessel is double-ended; both bow and stern are slightly blunted similar to the bow in Figure 28. The stem and sternposts rise fairly steeply from a slightly rockered keel, and finish at an approximately equal height. The sheer strake or caprail is vaguely defined by two parallel lines, curving in a sweet sheer. One steering oar or paddle is mounted astern, in the typically Venetian oarlock. Its oar slot is aft. Two figures in the boat hold the anchor line tied around the neck of the sinking saint. The anchor is of the millstone type.

Figure 48

| | |
|---|---|
| Manuscript title: | *Chronologia Magna*. |
| Artist/author: | Paulinus Venetus. |
| Theme: | World Chronicle: naval battle. |
| Location: | Biblioteca Nazionale Marciana, Venice, cod. marc. Lat. Z 399 (=1610), folio $76^{v}$. |
| Date: | Second half of 14th century. (Pallucchini, 1964: 216-223). |
| General types: | Two long ships (Type IIa), to right, and two war transports (Type IIb), to left. |
| View: | Long ships: port profiles.<br>Transports: starboard profiles. |

*Chronologia Magna*, a 14th-century Venetian world chronicle, contains a few ship illustrations of interest. In this figure, the naval battle depicted contains several warship galleys viewed from port, along with two transport ships seen from starboard. In all cases, the vessels seem to have a slightly rockered keel and a relatively horizontal sheer strake. Quarter rudders held by a *luctatorium* pass through the side of the hull to the small quarter-deck. The warships have a pointed beak at the bow, the *sperone*, which served as a boarding bridge (Casson, 1964 B: 74). The warships are considerably longer than the transports.



**Figure 47** The Martyrdom of St. Clement, illumination from a 14th-century manuscript of the Biblioteca Nazionale Marciana (Kaftal, 1978: fig. 282).



Figure 48 Naval battle, from the 14th-century manuscript, *Chronologia Magna*, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

Figure 49

Manuscript title: *Chronologia Magna*.
Artist/author: Paulinus Venetus.
Theme: World Chronicle.
Location: Biblioteca Nazionale Marciana, Venice, cod. Lat. Z 399 (=1610), folio $78^{v}$.
Date: Second half of 14th century (Pallucchini, 1964: 216-223).
General types: Two war transports (Type IIb).
View: Starboard profiles.

This illumination shows two transport ships like those in Figure 48 sailing abreast. Each of their single masts has a lateen sail and supports a cylindrical crow's-nest aft of the head of the mast. Two of three shrouds or stays and tack and vang lines are generically delineated. From the slightly rockered keel, stem and sternposts rise and curve inward. The line of the hull generated by these timbers is almost oval. Each rudder, similar in shape to the one depicted on folio $13^{R}$ in the *Fabrica di galere* manuscript, is attached through a *luctatorium*. A hawse hole is indicated at the bow.

This manuscript has numerous other similar illustrations of ships, from small fishing vessels to warships at oar, sail, or fighting, but by far the most interesting illustration is the next figure, one of a round ship in the process of loading.

Figure 50

Manuscript title: *Chronologia Magna*.
Artist/author: Paulinus Venetus.
Theme: World Chronicle: round ship in loading process.
Location: Biblioteca Nazionale Marciana, Venice, cod. Lat. Z 399 (=1610), folio 12.
Date: Second half of 14th century (Pallucchini, 1964: 216-223).
General types: Two medium-sized round ships (Type IIIb), and in the foreground, two lighters (Type Ib).
Views: Port and starboard profile.

The state of preservation of this page of the manuscript is unfortunately quite poor. This folio contains two maritime images of great interest. One is a mirror image of the other. Since they are basically identical, the more complete one, showing the starboard profile of a ship and lighter, will be discussed.

One can barely discern a lighter in the foreground, from which cargo is being loaded onto a round ship very similar to that seen in Figure 49. The two masts, both forward raking at about 20 degrees, have been employed to fashion a lifting device. A line runs from the head of one mast to the other's. Another line runs through a whip tackle attached near the center of that line. This line, being hoisted by a



Figure 49 Two transport ships under sail, from the 14th-century manuscript, *Chronologia Magna*, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

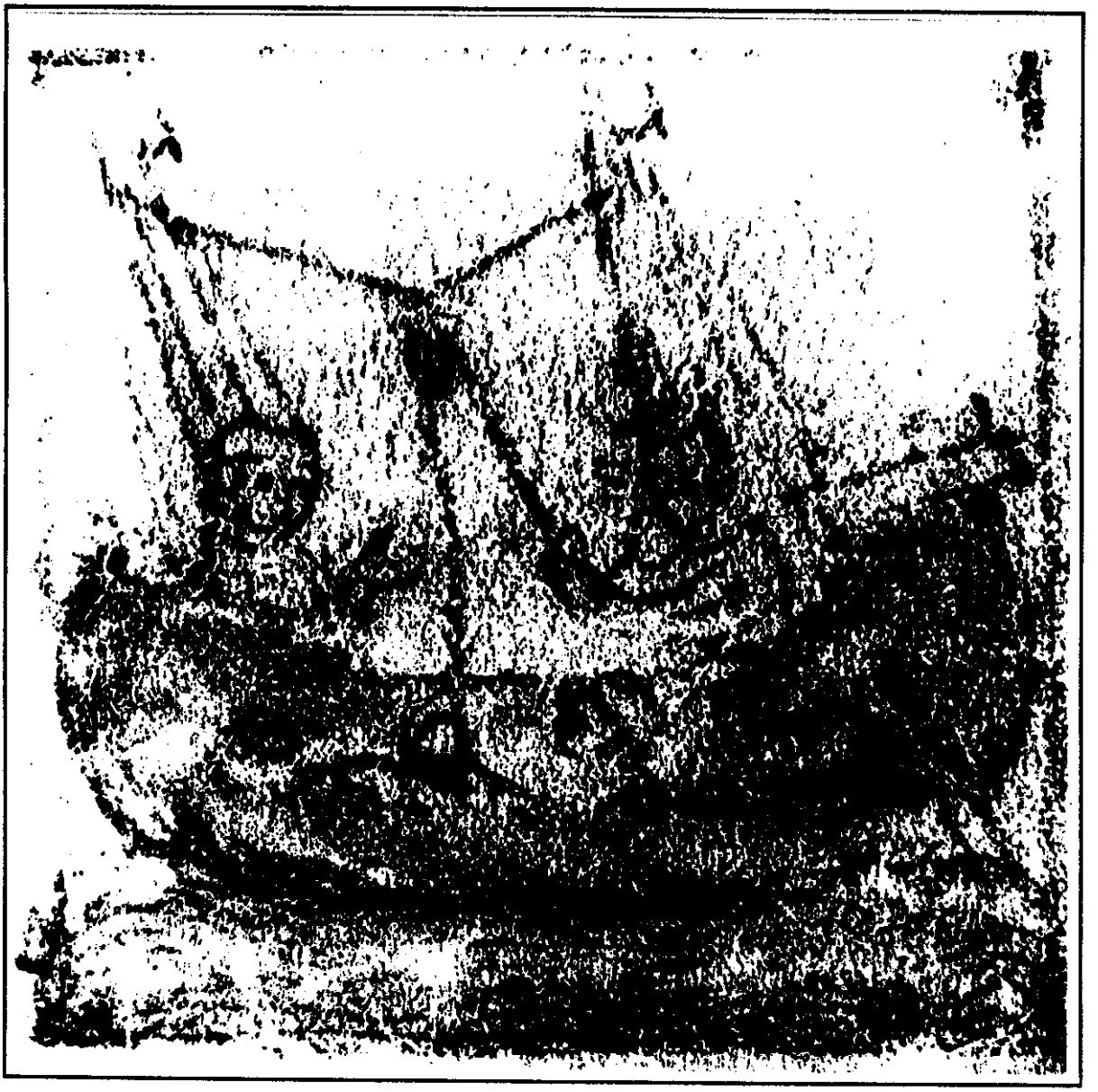


**Figure 50** Round ship in the process of loading, illumination from the 14th-century manuscript, *Chronologia Magna*, of the Biblioteca Nazionale Marciana (Courtesy of the Library).

man near the stern, lifts cargo aboard. The tackle depicted in this illumination may be a rare representation of what texts have referred to as *ternarius*, which Pryor has translated as "large tackle [used] for stowing gear (1984, no. 2: 215)."

Since the sides of medieval vessels were curved, cargo would have scraped along the side of the ship if loaded in such a manner, but this is clearly the way it was done. Forestays and backstays provide the mast additional support.

Figure 51

Manuscript title: Miscellanea.
Theme: Departure for Crusades.
Location: Biblioteca Nazionale Marciana, Venice, cod. marc. Gr. II, 17 (=1295), folio $20^{R}$.
Date: 14th century (Concina, 1988: fig. 31).
General type: War transport (Type IIb).
View: Starboard side, slightly from above.

This illustration from a manuscript written in Greek, preserved in the Biblioteca Nazionale Marciana in Venice, portrays a Crusader bidding farewell to his lady. Because of its full shape, the ship in which they stand is most likely a merchant ship in use as a transport. It has been sketched with a flat bottom, a steeply rising stem and an elaborately decorated full stern similar to the shape of that in the figure on page 182. Due to the angle portrayed, both hawse holes are viewed from the inside of the hull. The unbalanced rudders, mounted through a *luctatorium*, are twisted in a reversed position which would have made the ship totally unnavigable if under way. However, the ship is not under way; perhaps the rudders were stored in this position while in port (as discussed for Figure 10).

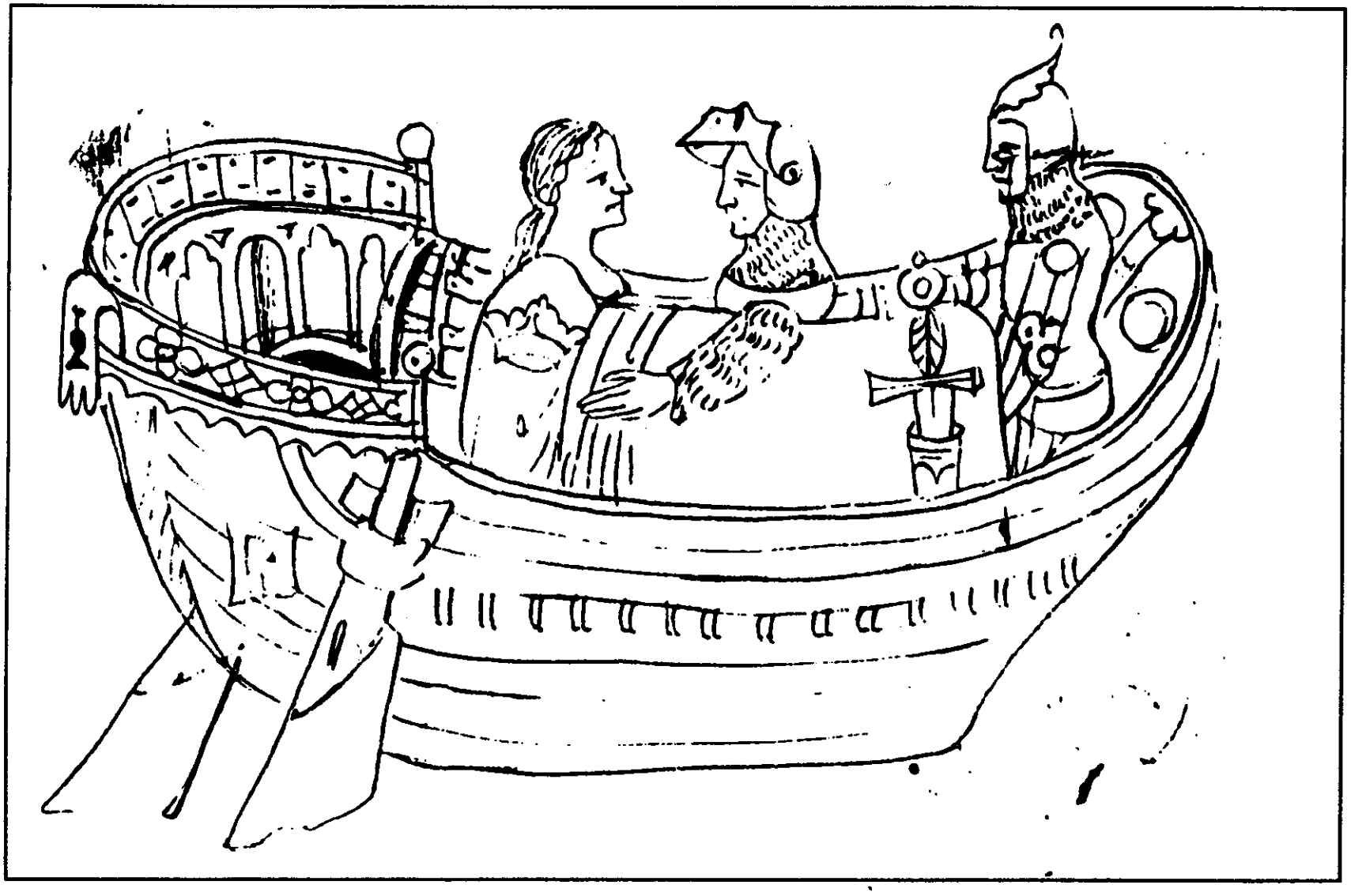


**Figure 51** Crusaders' departure, from an untitled 14th-century manuscript of the Biblioteca Nazionale Marciana (Courtesy of the Library).

Figure 52

Manuscript Title: *Li Livres du Graunt Caam.*
Theme: Marco Polo setting sail from Venice in the year 1271, from Marco Polo's own account of his travels.
Artist: Johannes.
Location: Frontispiece of a copy of *Li Livres du Graunt Caam*, illuminated in England by Johannes, copy MS. Bodl. 264, folio 218$^{R}$ (detail), Bodleian Library, Oxford.
Date: ca. 1400.
General types: Four large, square-rigged round ships (Type IIId), two large oared galleys (Type IIa), with two lateen-rigged masts, two small lagoonal craft (Type Ia).
View: Port profiles, except one lagoonal craft seen from bow and slightly from above.

The round ships are of the new cog type, with a single square sail, castles at bow and stern, and steered with a single stern rudder. In each case, the single mast is set vertically amidships, and the spars are shorter than those fitted to a lateen-rigged vessel. The two cogs to the right have their sails set, while the two to the left have their sails still furled. All four have prominent, large, centrally placed crow's-nests, reached via rope rat lines. The rigging is accurately defined throughout. Particularly evident are the shrouds, stays and braces, and robands along the yards.

The hull construction of the round ships can best be seen in the cog to the far left. Parallel strakes are delineated, with their carefully spaced vertical rows of nails. The castles at bow and stern have braces to the exterior of the hull beneath them. The forecastle is higher than the stern castle. The stern supports a rectangular rudder, hung with pintles and gudgeons.

The two oared trireme galleys have two lateen-rigged masts each, plus oars clustered in groups of three, and a tented area at the stern. Details of their construction, beyond the basic long ship shape, are obscured by their dark color.

The lagoonal craft in the background have bluff sterns similar to those in Figure 2 and Figure 17. Rows of straking are delineated, and the stem is well defined in both cases. A small seat is apparent in the boat beneath the bridge. Its sailor stands, working his paddle, while the two men in the boat to the right are seated, and work two paddles to starboard.



**Figure 52** Marco Polo's departure from Venice, from a frontispiece of *Li Livres du Graunt Caam*. a manuscript dating to ca. A.D. 1400, now preserved in the Bodleian Library (Courtesy of the Library).

Figure 53

| | |
|---|---|
| Manuscript Title: | *Hesperis*. |
| Theme: | Epic poem written in praise of Sigismondo Malatesta. |
| Author/Artist: | Giovanni di Bartolo Bettini da Fano or Matteo de'Pasti (Kauffmann, librarian at the Bodleian, personal correspondence, March 26, 1991). |
| Location: | From Rimini; now kept in Bodleian Library, Oxford, MS. Canon. Class. Lat. 81, folio 70$^{R}$. |
| Date: | ca. 1457-1468. |
| General types: | Eight oared galleys (Type IIa), seven large round ships (Type IIIe), and three small coastal lagoonal craft (Type Ie). |
| View: | Starboard profiles. |

I am aware of four maritime illustrations in *Hesperis*, although it may have more; I have not seen the original manuscript. One shows a two-masted round ship (Type IIIb) breaking up in storm, another, two mixed-rig cogs (Type IIIe), the third, four oared galleys (Type IIa), and two round ships, one cog and one mixed-rig (Type IIId and IIIe). Only the fourth is reproduced here, with four oared galleys (Type IIa) and two mixed-rig cogs (type IIIe) as it is the most informative and characteristic.

In this illustration, Figure 53, four galleys are shown under way: the two in the foreground travel only under oars, while one in the background, right, is powered by oars and sail, and the fourth, background, center, by sail only. These two with masts stepped show their single masts set far forward; the one with visible crow's-nest has it oddly positioned forward of the mast. The shrouds and vang, with its tackle, are indicated, as are robands.

The three under oars have their oars grouped in threes, supported by an outrigger. Each has a beak or boarding platform at the bow and a tented area at the stern. No tent has been hung on the stern on the galley to the left, leaving the swing mount rudder system and its rudder completely visible.

In the background are three generic small coastal or lagoonal craft (Type Ie) with one lateen sail, and two, vaguely defined, two-masted mixed-rig vessels.

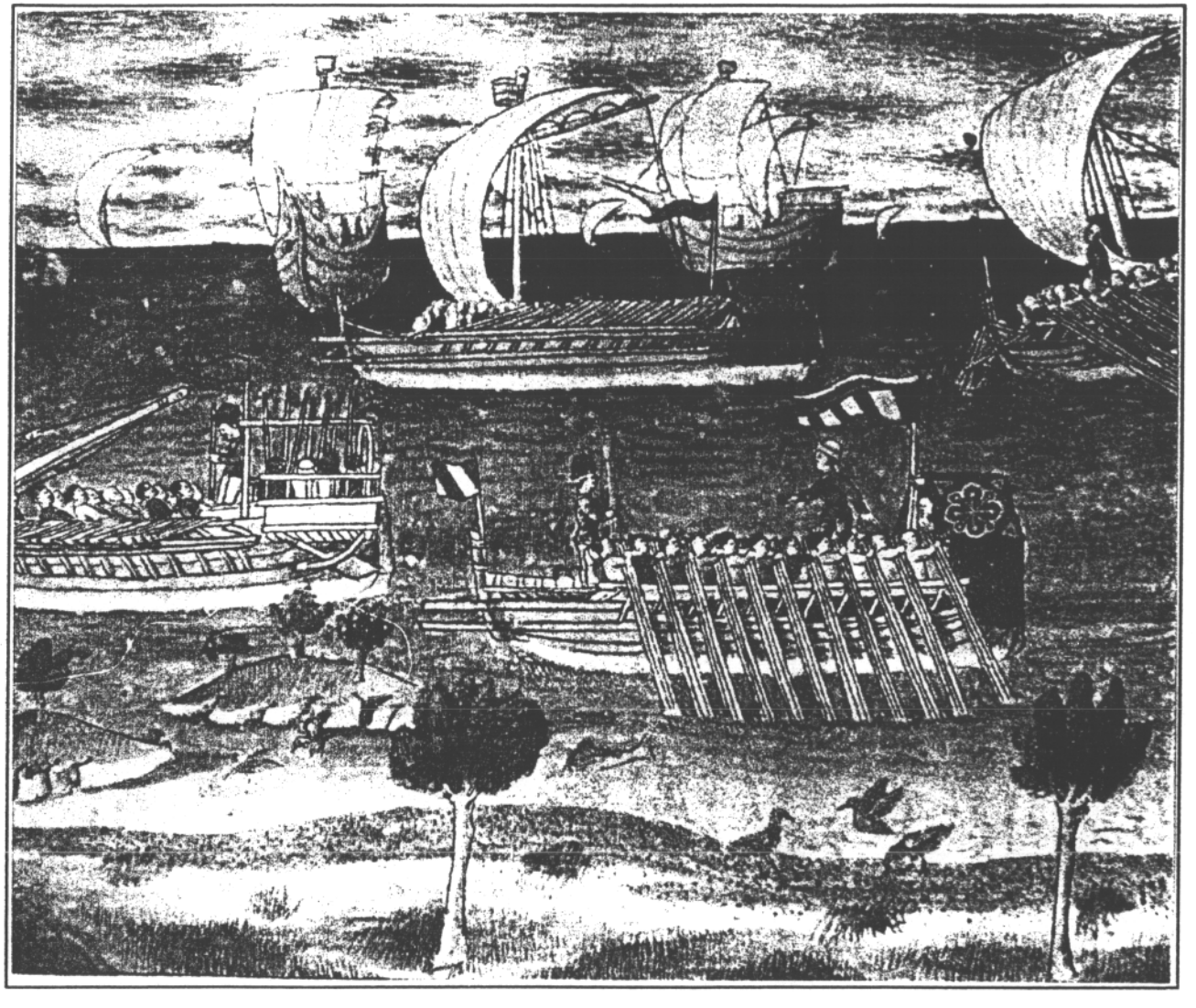


**Figure 53** Galleys and round ships from *Hesperis*, a manuscript from Rimini dating to ca. 1457-1468, now kept in the Bodleian Library (Courtesy of the Library).

Figure 54

Manuscript Title: *Mappamondo di Andrea del Bianco.*
Author: Andrea del Bianco.
Theme: World map.
Location: Biblioteca Nazionale Marciana, It. II 76 (=4783). Lat. 81, folio $70^{R}$.
Date: 1458.
General type: One square-rigged round ship (Type IIId).
View: Port profiles.

The merchant ship depicted is a square-rigged cog, with a single rudder affixed to the stern. Two other examples of this ship type can be seen in the ship graffiti on columns of the main portal of San Marco (Helms, 1975: fig. 4, ships 3 and 4), which, like all graffiti, are difficult to date with any precision.

The main mast is set slightly forward of midships with a large crow's-nest centrally placed at its head. There is a small bowsprit at the forecastle, to which sheet lines of the mainsail seem to tie off. The forestays, shrouds, and bunt lines are clearly defined.

The hull shape is full at bow and stern. The keel seems rockered. The sternpost is almost straight while the stem rises rather steeply at the bow. The forecastle is much higher than the sterncastle. Both have parapets. The strakes run parallel to the keel and the sheer strake, with no apparent convergence to fit into the posts. Cross-planking, like that seen in the figures on pages 151 and 191, is visible at the bow.

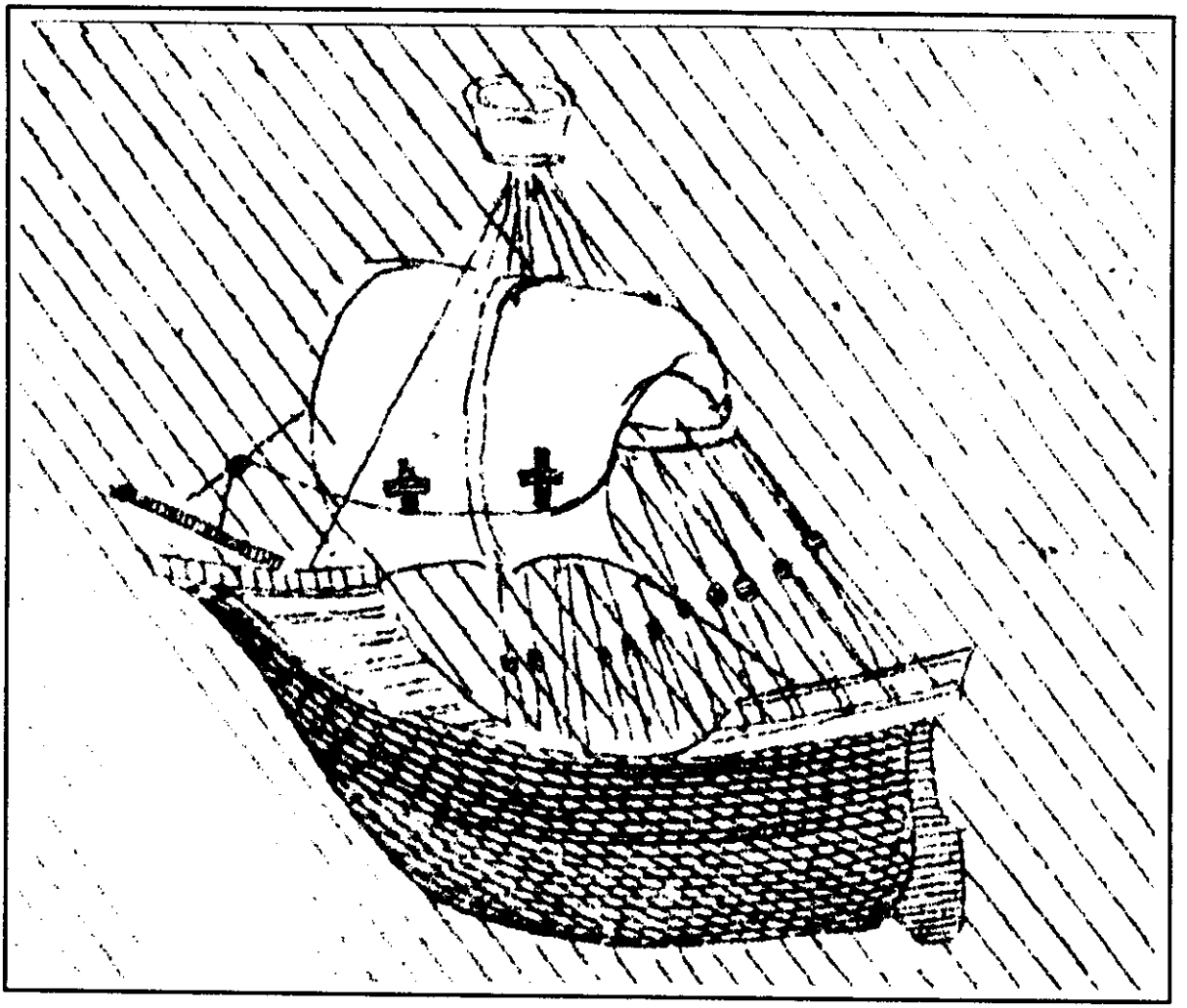


**Figure 54** A round ship from the *Mappamondo di Andrea del Bianco* dating to 1458 (Courtesy of Seminario Patriarchale).

Figure 55

Manuscript Title: *Mappamondo di Andrea del Bianco.*
Author: Andrea del Bianco.
Theme: World map.
Location: Biblioteca Nazionale Marciana, It. II 76 (=4783). Lat. 81, folio 70$^{R}$.
Date: 1458.
General type: Two oared galleys (Type IIa).
View: Port profiles.

Neither galley depicted reveals evidence for masts, though it is likely they would have had removable ones. The upper vessel has eleven oars arranged along one level, while the lower vessel has thirteen. The hulls of both are shallow drafted, narrow and sleek, with a gradually rising stem and a more sharp inclination at the stern where a single stern rudder is attached. A continuation of the wale projects from the bow of each vessel, and stantions for a tent structure appear on both sterncastles.

## Manuscripts, Technical Treatises

Delving into entire manuscripts concerning ship construction, aspects of seamanship or trade is beyond the scope of this study. To consider the texts of these sources would doubtless be useful, but their calligraphy alone presents boundless problems. Illustrations from these technical treatises are informative even without interpreting their texts, however, and so six have been included in the catalog. Other scholars' work with the texts is referenced when appropriate.

Figure 56, Figure 57

Treatise Title: *Zibaldone da Canale.*
Artist/author: Zibaldone da Canale.
Theme: Mercantile manuscript.
Location: Copy in Yale Beinecke Rare Book and Manuscript Library, Yale University.
Date: ca. 1312 (Beinecke Rare Book and Manuscript Library).
General type: Seven large round ships (Type IIIb).
View: Port and starboard profiles.

Five folios with a total of seven round ship illustrations are included in *Zibaldone da Canale*, a book primarily concerning practical aspects of seamanship, such as setting up rigging, sails, etc., with one section devoted to ship construction. All illustrate two-masted, lateen-rigged merchantmen with sails furled, provided with brace-mounted quarter rudders. Only two folios are reproduced in this catalog, since all seven versions represent the same basic ship type, and differ only in a few details or careless omissions on the part of the artist.



Figure 55 Two oared galleys, from the *Mappamondo di Andrea del Bianco*, dating to 1458 (Courtesy of Seminario Patriarchale).

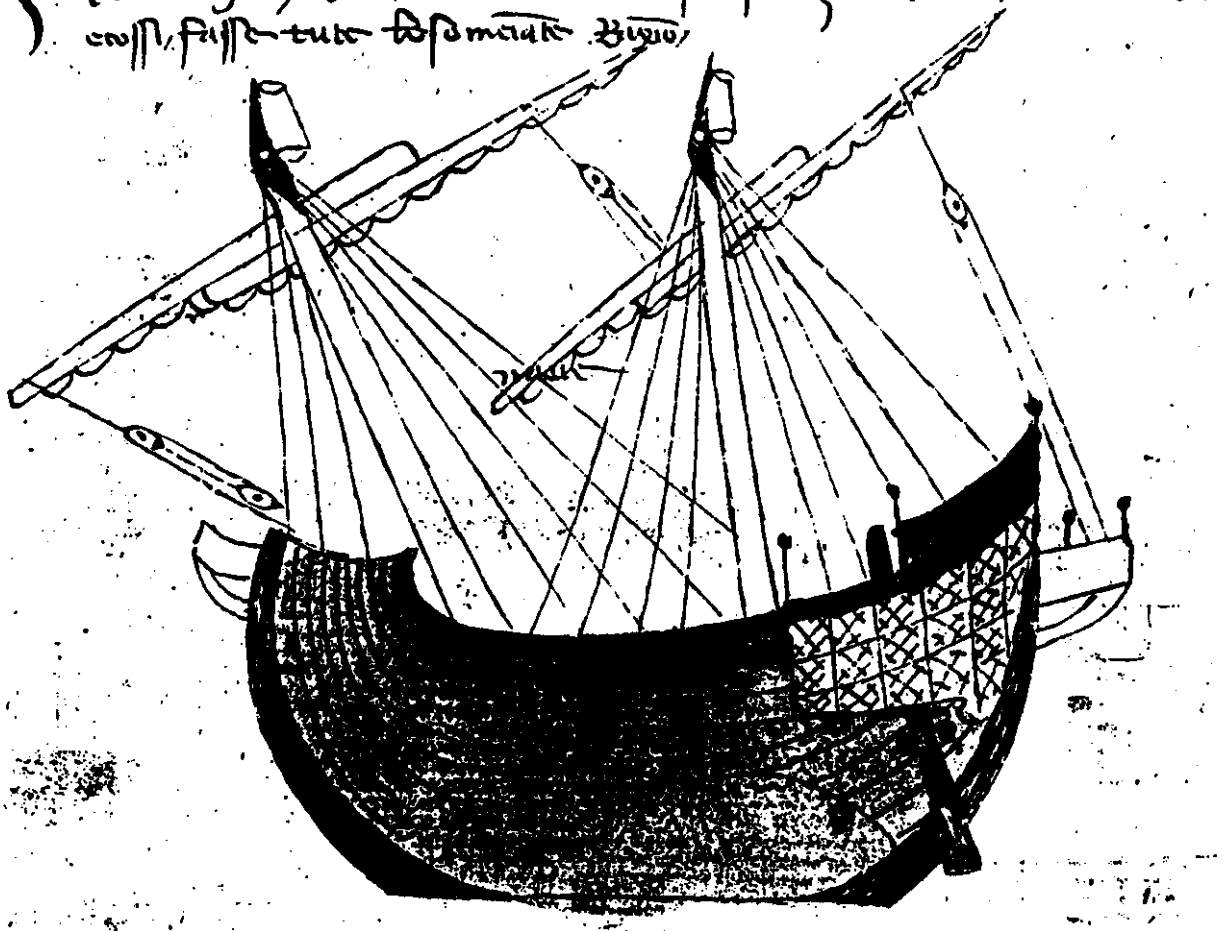


**Figure 56** Ship illustration from *Zibaldone da Canale*, a Venetian manuscript from a copy in the Yale Beinecke Rare Book and Manuscript Library dating to ca. 1312 (Courtesy of the Library).

For example, at the base of both masts, wedges (as seen in Figure 26 and Figure 28) are included in all of the examples, except Figure 56. One consistent nautical error is found in the portrayal of the shrouds: three per side are usually sketched as passing from the top of the mast to deck, but only on the forward side of each yard, regardless of whether that vessel is shown from port or starboard. In actuality, half of the lines would have passed behind, on the far side of the yard, to secure the mast to both points. Another problem exists with the vang and tack - often one or both are not depicted.

All the representations show certain features in common, however, best illustrated by Figure 57, which depicts two vessels, bow to bow. Each vessel has two masts: the mizzen is set slightly aft of midships almost completely vertically (within 3 degrees), the foremast stands about halfway between midships and the stem, raking forward at about 23 degrees. The furled yards, hung high on their masts, are each composed of two spars, the *cares* (lower section) and the *pennae* (upper section). Three shrouds per side attach just beneath the crow's-nests to support each mast. The ship to the right shows the halyards of both masts secured aft, doubling as a backstay. This line is not evident on the ship depicted to the left. The cylindrical crow's-nest, probably made of wicker or wooden staves, is attached to the aft side of the top of each mast, where a well-defined sheave block is evident (also detailed in Figure 73). These blocks were called *cholzexe* in nautical texts such as the *Fabrica di galere* (folio $18^{v}$). According to Pryor (1984, no. 3: 286), the *cholzexe* was "a massive piece of timber scarfed to the masthead and which had two lateral pulleys (the *pulezia*) inserted in it beam to beam by means of which the lateen yards were hauled up the sides of the mast (1984, no. 3: 286)." Some vang and tack with their respective pulleys can be seen in Figure 57 tied off to bow or stern and in other versions, to the small platform projecting aft. In Figure 57, only four of the eight vang and tack required for two two-masted lateeners have actually been drawn: on the left ship, only the foremast vang is sketched, while on the right ship, the mizzen vang (but not tack) is evident, as are both vang and tack on the foremast.

Like the Contarina ship (Contarina I; see discussion and figs. beginning on p. 216), the bottom is completely flat. The stem and sternposts curve gently upwards, and inward at the bow. The stem is slightly more curved, implying a fuller rounded bow. Planking runs parallel to the sheer and the stem, but converges to fit into the bow. Beneath the castle at the stern, planking seems to finish at the post. Details of the planking behind the quarter-deck structure are covered by

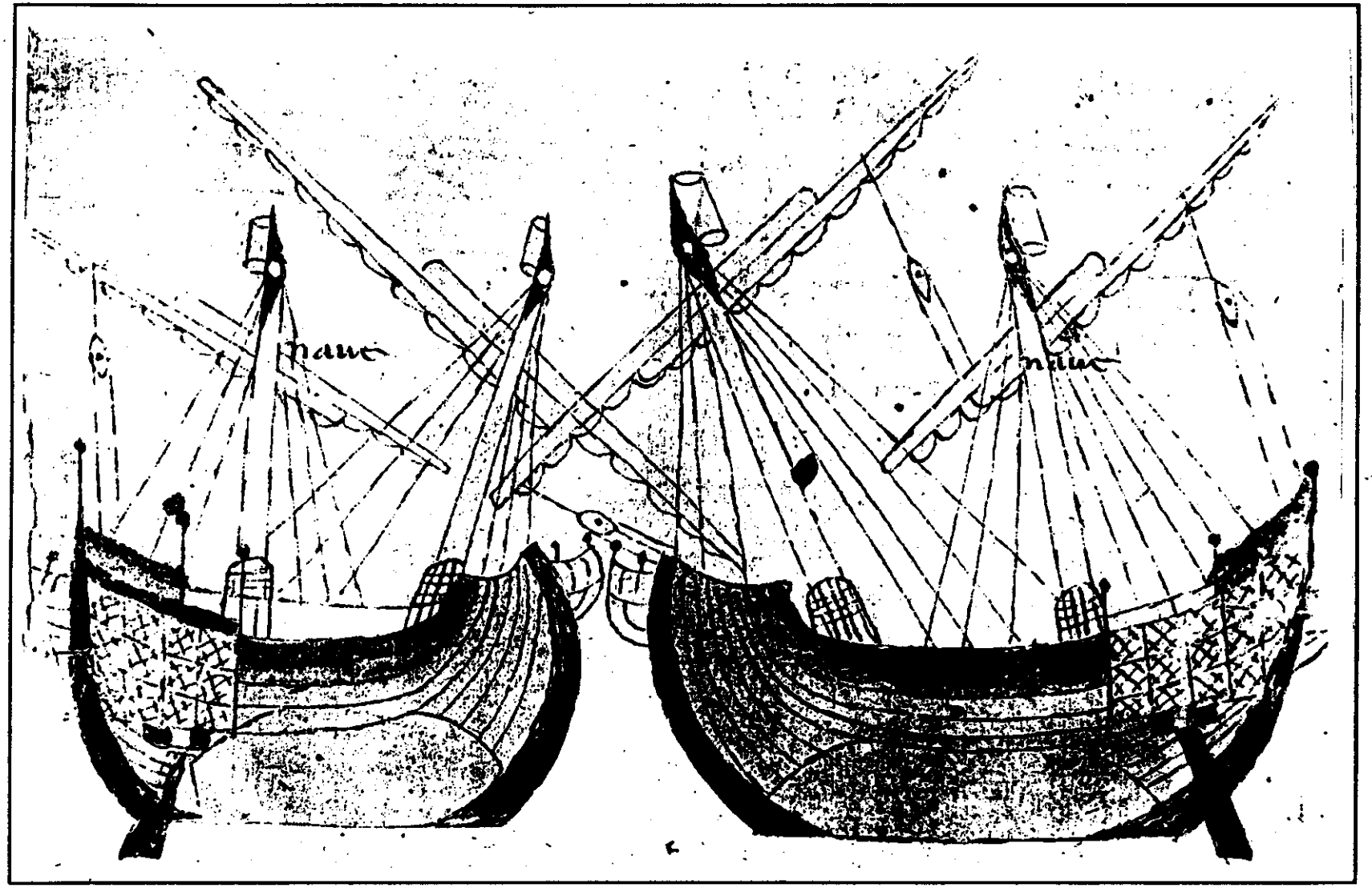


**Figure 57** Two ships illustrated in *Zibaldone da Canale*, a Venetian manuscript from a copy in the Yale Beinecke Rare Book and Manuscript Library dating to ca. 1312 (Courtesy of the Library).

that structure.

Although the ships differ in shape at bow and stern, both the bow and stern have platforms projecting beyond the main lines of the ship where perhaps a spar was placed, or a riding bitt, or possibly a fighting platform (*bellatorium* or *ballador*). These platforms are supported by braces below, and have thin uprights decorated with finials. The small platform at the bow may have been used for working the foresail, or, if a riding bitt, for catting up the anchor.

The quarter rudder is shown attached with a brace-mount, between two through beams. The shaft passed through the floor of the quarter-deck and inboard.

Figure 58

| | |
|---|---|
| Treatise title: | *Arte de far vasselli*. |
| Theme: | Technical treatise on galley construction. Ship shown under construction. |
| Location: | Vienna Osterreichische Nationalbibliothek, Cod. 6391 (copy of 15th-century *Fabrica di galere*), Vienna. |
| Date: | 16th-century copy of original manuscript, ca. 1410. |
| General type: | Oared merchant galley (Type IIIa). |
| Views: | Starboard profile and midships section. |

Although this manuscript dates from the 16th century, as a copy of an earlier manuscript of 1410, it falls within the confines of this study. Two folios have been selected for discussion, one illustrating a galley profile (Figure 58), and the other, a Flanders galley under sail (Figure 59). Together they offer a rough idea as to the shape and construction of an early 15th-century Flanders galley. The profiles sketched in Figure 58 indicate a 4.5 : 1 length : beam ratio.

The keel is straight. The asterisks marked at either end of the keel indicate the position of the scarf for the stem and sternposts. The stern is slightly fuller than the bow, where the rake is about 62 degrees. An outrigger, seen also in the following figure, runs along most of the ship.

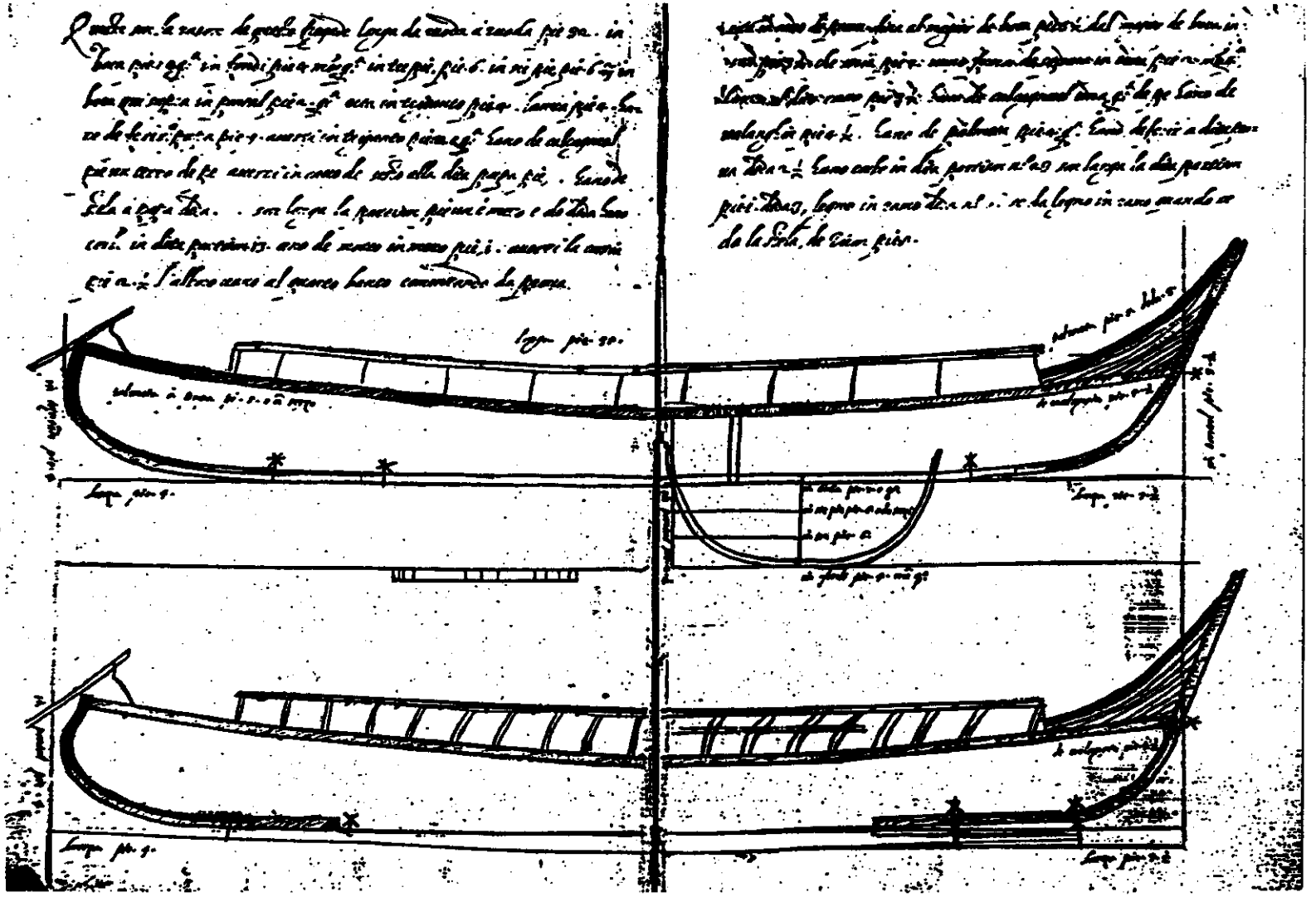


**Figure 58** Profiles of galley, from Arte *de far vasselli*, a 16th-century copy of the 15th-century *Fabrica di galere* (after microfilm of the manuscript, by courtesy of Dr. Ennio Concina).

Figure 59

| | |
|---|---|
| Treatise title: | *Arte de far vasselli*. |
| Theme: | Technical treatise on galley construction: Flanders galley under sail. |
| Location: | Vienna Osterreichische Nationalbibliothek, Cod. 6391, folio $14^{v}$. (copy of 15th-century *Fabrica di galere*), Vienna. |
| Date: | 16th-century copy of original, ca. 1410 (Concina, 1988: 85). |
| General type: | Merchant galley (Type IIIa). |
| View: | Starboard profile. |

This illustration is of particular interest because it represents a single-masted lateen-rigged merchant galley with the transitional system of both side and stern rudders. It probably represents the same ship type as the previous figure, but is shown under sail. According to Lane (1973 B: 122), the ship design with a curved rudder on the sternpost, called elsewhere in the manuscript a *timon bavonescho*, would have needed the supplementary quarter rudders to be manageable. Bonino also points out that the quarter rudders, called *zanca*, were still essential, since the curved stern rudder could break quite easily (1988).[30] Later, once the sternpost was straight, and its stern rudder more strongly attached with iron pintles and gudgeons, side rudders became superfluous. The manuscript specifies that the ship had 73 or 74 frames (Lane, 1934: 8).

The single mast is set slightly forward of midships. Its vertical orientation is in error for a lateener. The yard consists of four spar sections spliced together; the extra two sections would be added when a larger sail was required. Slender rectangular bands of sailcloth, sewn together at their ends and sides to form the bellied sail, are clearly recognizable, as is a rope parrel. Horizontal lines along with longer vertical ones ascertain the lines must be meant to indicate seams and not brails. Seven lines with tackle arranged aft of the mast indicate shrouds or stays. The vang is shown tied off aft to both port and starboard. No bowline is indicated.

At the quarter-deck, two crutches brace a horizontal bar to support a tent, surrounded by a parapet (as seen in Figure 27, Figure 36, and Figure 60). An outrigger, with nine supports from below and a balustrade above, runs forward from where the stern parapet finishes to just aft of where a grapnel anchor is hung with its crown slung forward. Note the capstan at the bow.

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[30] The stern rudder was also called *alla Faustina*. The quarter rudder was referred to as either a *zanca* (as per Christoforo Canale in *Della militia marittima*) or a *timon alla Ponentina* (as per Stefano de Zuanne, 1686) (Bonino, 1987: fig. 1 F and personal communication).

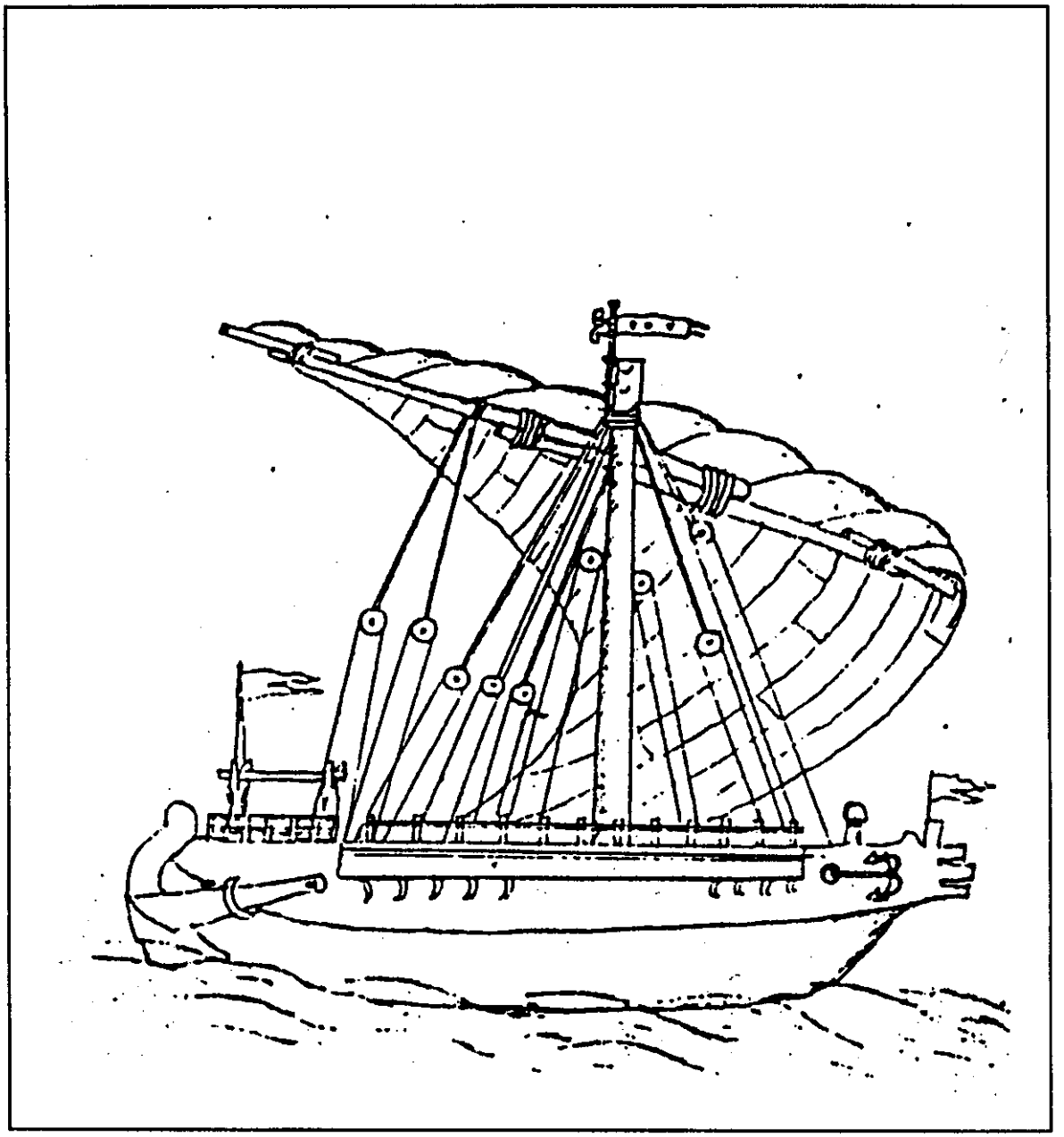


**Figure 59** Flanders galley under sail, from *Arte de far vasselli*, 16th-century copy of 15th-century *Fabrica di galere* (after Concina, 1988: fig. 82, by courtesy of Dr. Ennio Concina.

Figure 60

| | |
|---|---|
| Treatise Title: | Book of Zorzi of Modone. |
| Artist/author: | Zorzi of Modon, also called Trombetta or Timbotta of Modon. |
| Theme: | Technical treatise on seamanship. |
| Location: | British Museum Library, London, MS Cotton Titus A, XXVI, folio 48$^{v}$., London. |
| Date: | 1444 or 1448-1449. |
| General type: | Large merchant galley (Type IIIc). |
| View: | Starboard profile. |

The grouping of the fifty-seven oars in threes makes this three-masted lateen-rigged merchant galley a trireme.

The three masts diminish in height, and their sails are reduced in size, from the largest, the foremast and its sail, to the smallest mast and its sail aft. All masts are shown as nearly vertical, except strangely enough, the central mizzen mast, which inclines about four degrees off vertical. This is so minimal, however, that it could be a sketching error. The foremast at least should incline forward. Two spars form each yard; these are lashed together with wooldings at two places on the mizzen and after masts' yards, but in four places on the largest yard of the foremast. No crow's-nests have been depicted.

Various rigging lines have been defined while others omitted. There are those on the foremast and five shrouds to starboard, a pair of vang lines, which have both also been drawn to starboard, and the first clear example we have of the *mulgaranus* and its tackle, a heavy rope attached to the base of the yard to control its fore and aft movement. This was necessary to peak the yard either while tacking or to obtain maximum efficiency while sailing. Two bowlines are also tied to the lower end of the *cares*, one for port and the other to haul to starboard.

Sheet and bowlines are drawn for the sails of the after and mizzen masts, as are the vang.

Although much larger and sleeker in shape, the galley is similar to that of Figure 59. The keel is almost completely straight. A parapet surrounds the quarter-deck, where two stantions supporting a horizontal bar served to support a tent (as in Figure 27, Figure 36, Figure 46, and Figure 59).

This vessel, dating from the mid-15th century, is apparently completely dependent on the new system of a single rudder attached to the curved sternpost with pintles and gudgeons, it is shown to curve actually beneath the hull, and there is no evidence of supplementary quarter rudders.

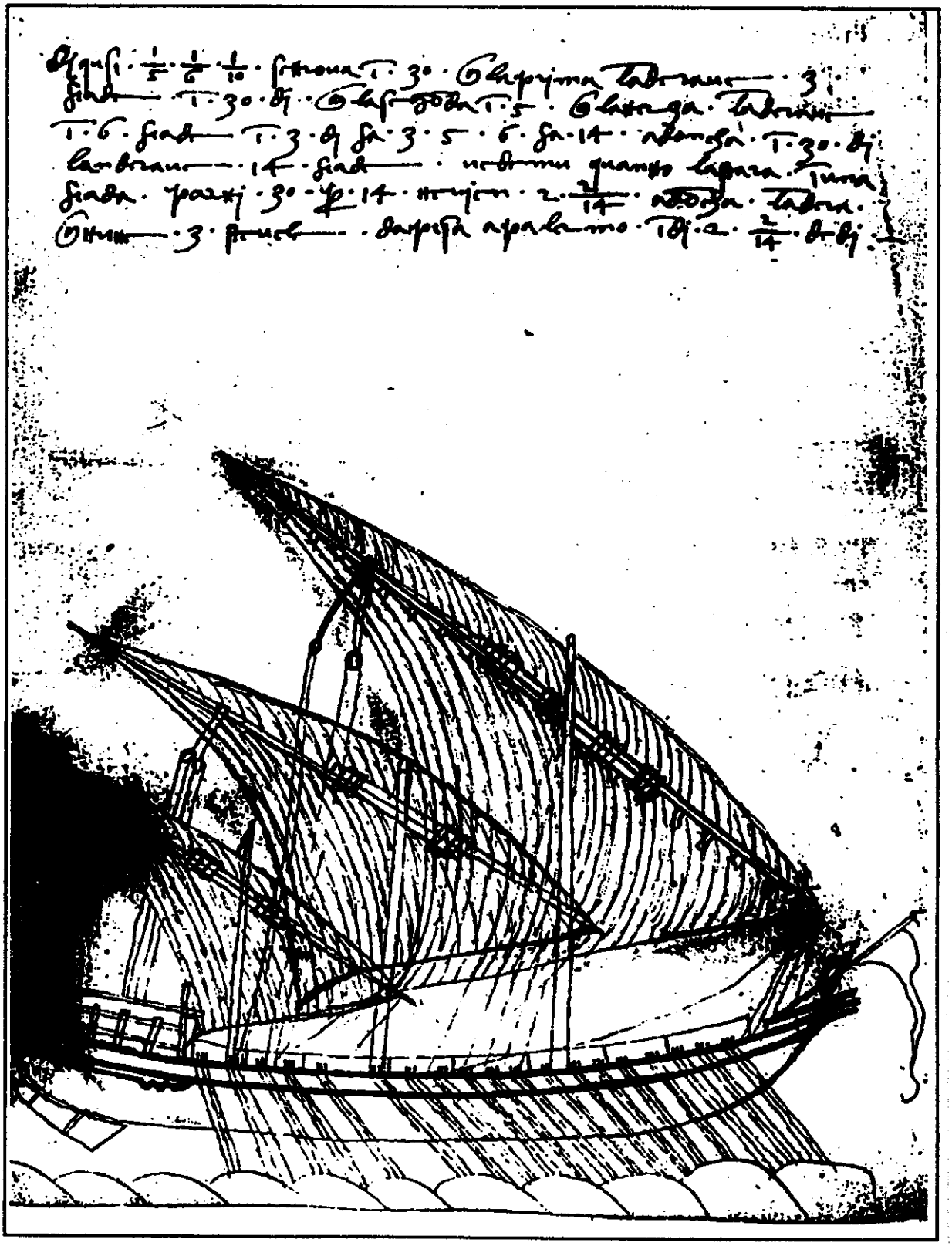


**Figure 60** Galley under navigation, from the 15th-century book by Zorzi of Modon (Concina, 1988: fig. 80, by courtesy of Dr. Ennio Concina).

Figure 61

| | |
|---|---|
| Title: | Book of Zorzi of Modone. |
| Artist/author: | Zorzi of Modon, also called Trombetta or Timbotta of Modon. |
| Theme: | Technical treatise on seamanship: profiles of galley. |
| Location: | British Museum Library, London, MS Cotton Titus A, XXVI, folio 57. |
| Date: | 1444 or 1448-1449. |
| General type: | Large merchant galley (Type IIIc). |

This illustration is a construction plan for a ship type similar to that shown under sail in Figure 60, and gives profiles and dimensions of a small merchant galley. The beam at midships is specified as 5.5 *piede* (1.91 m.), the width in *fondo* is 3.5 *piede* (1.22 m.), and the overall length is 23 *piede* (8 m.).

The keel is straight; the hull bottom is almost completely flat. The stem is slightly higher than the sternpost. The shape of the stem and sternposts, the near-horizontal sheer strake, and the shape of the vessel in general are identical to that of Figure 60. The strakes of either side of the hull, however, finish at the outer upright timbers and not into the sternpost. In fact, this brings us to the illustration's most noteworthy characteristic. The stern is completed with a wing transom to form a sort of transom stern not evident in Figure 60. The port and stern view clearly reveals the form of the end of the stern. It is formed with two outer frames and the central sternpost, where the rudder was fitted to the curve of the sternpost. The flat stern allowed the necessary movement of the rudder.

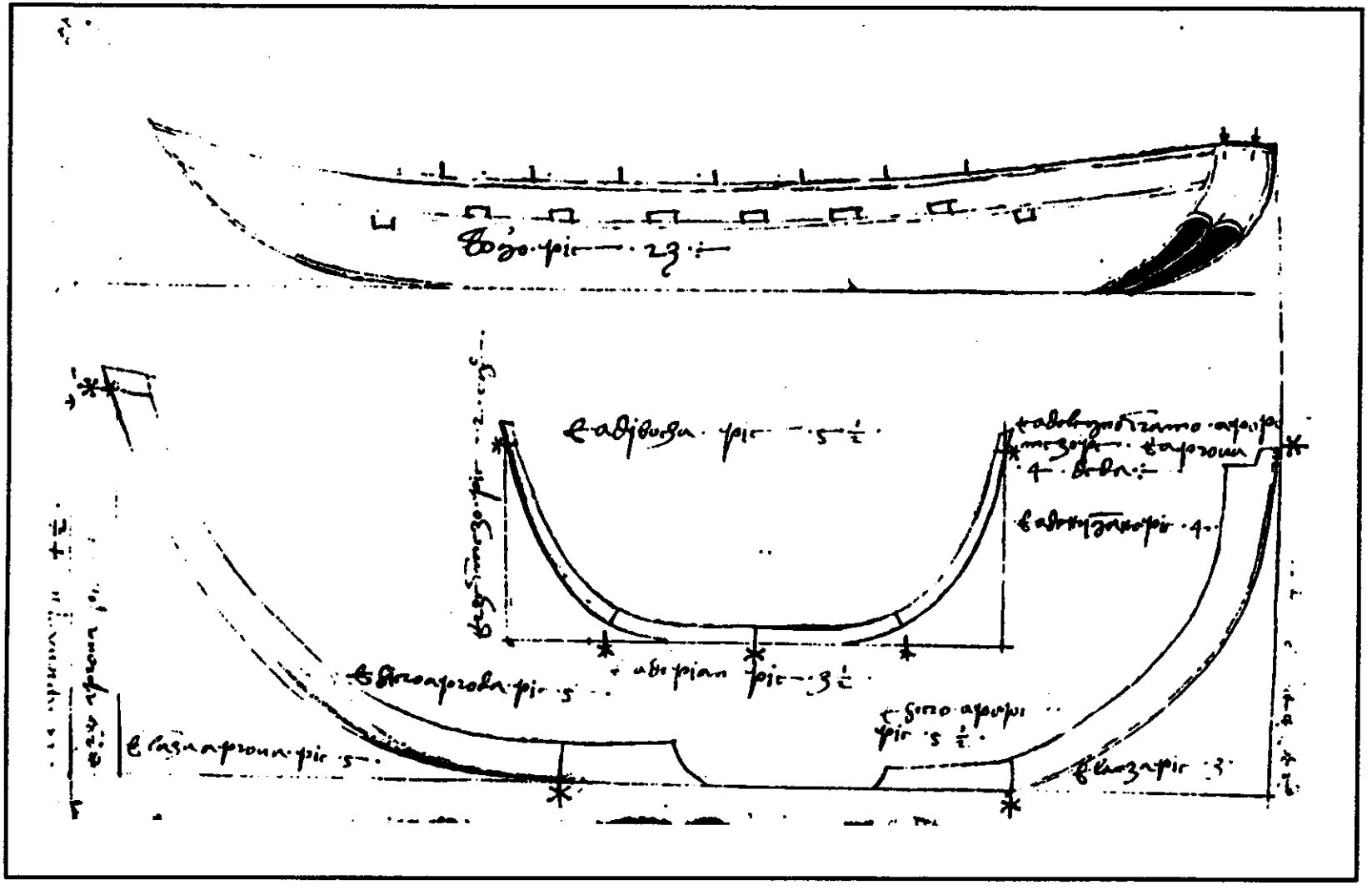


Figure 61 Profile sections of a galley from the 15th-century book of Zorzi of Modon. Note the flat transom stern (after microfilm of the original manuscript, by courtesy of Dr. Ennio Concina).

Figure 62

| | |
|---|---|
| Title: | Book of Zorzi of Modone. |
| Artist/author: | Zorzi of Modon, also called Trombetta or Timbotta of Modon. |
| Theme: | Technical treatise on seamanship. |
| Location: | British Museum Library, London, MS Cotton Titus A, XXVI, folio 41[R]. |
| Date: | 1444 or 1448-1449. |
| General type: | Medium-large sized, mixed-rig round ship (Type IIIf). |
| View: | Starboard side, slightly from stern. |

From the caption of this folio we know that Zorzi of Modon sketched his fifteenth-century concept of a *nave* of 1000 *botte*, which corresponds roughly to 600 dead weight tons (Lane, 1934: 249). It is a good representation of a Mediterranean cog, built the Mediterranean way, frame-first, and resembles a graffiti inscribed, perhaps within the same century, on a column of San Marco's main portico (Helms, 1975: fig. 2, ship 1). Dimensions given in the manuscript indicate a keel length of 85 *piede*, roughly 29.56 meters,[31] a width at the level of the first deck of 11 *piede*, or 3.83 meters, and 34 *piede*, or 11.82 meters at the level of the second deck (Lane, 1934: 237 and Table C). It also had an additional deck level at the stern castle and at the bow.

Only one mast has been stepped, the short bowsprit, raking far forward on the forecastle. A ship of this size would have had at least one main mast, rigged square, and probably an after lateen-rigged mast as well, as does the very comparable figure on page 191.

This illustration is helpful in interpreting the type's stern configuration. The hull planking beneath and just above the first deck level finish into the sternpost, while the next rows of strakes, that is, those strakes along the line of the hull where it begins to bulge outward (above the first deck level and before the tumble home) finish into the tragent. The strakes above these, forming the tumble home and bulwarks, end at the corners of the sterncastle. The result is a full stern, a characteristic type of wing transom like that seen in many medieval representations.

A grapnel anchor hangs from the bowsprit; its hawser passes through the starboard hawse hole.

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[31] 1 *piede* or *pie* equals .347735 m. (Lane, 1934: Table C).

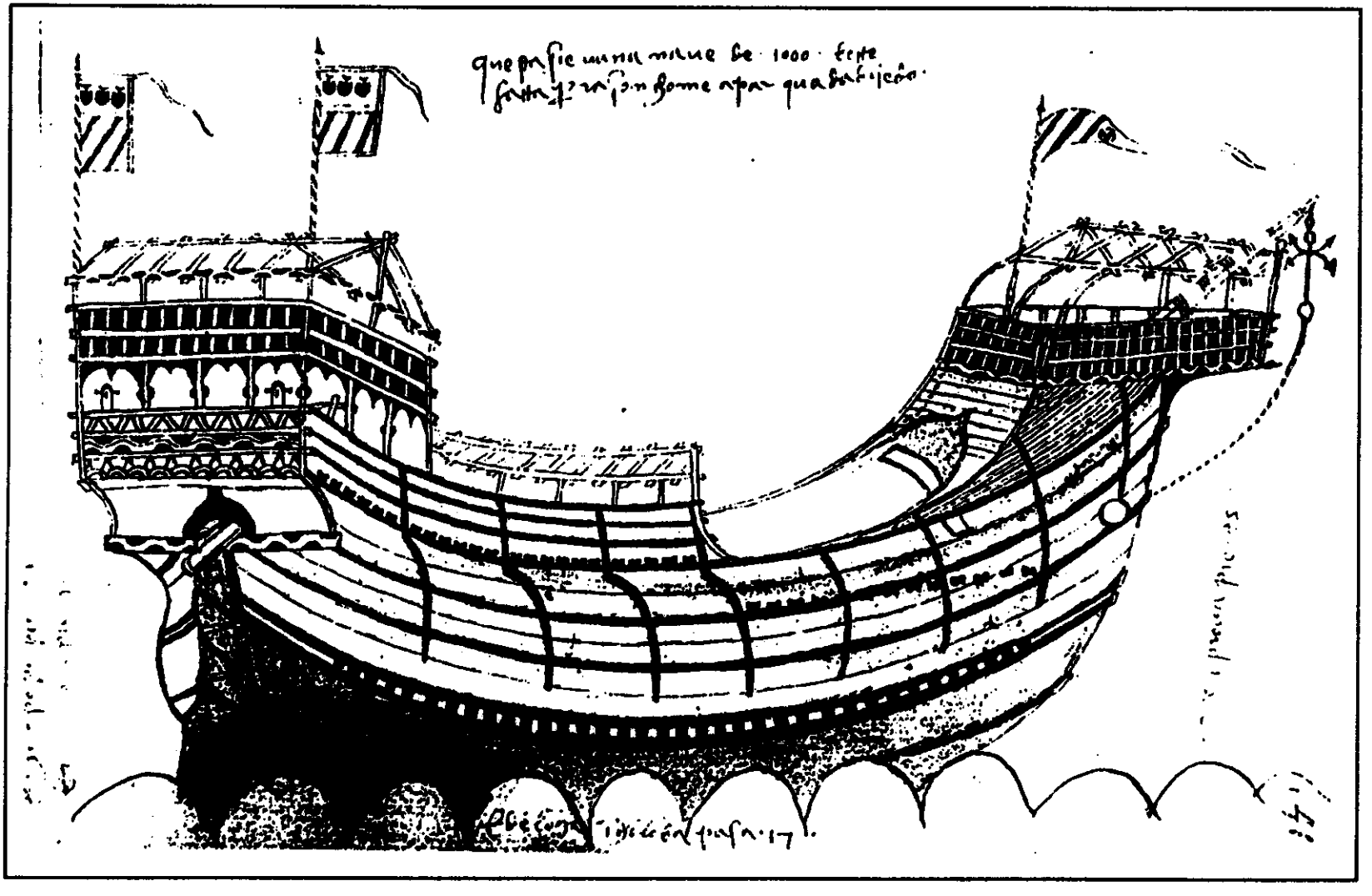


**Figure 62** *Nave* of 1000 *botte* from the 15th-century book by Zorzi of Modon. Note a grapnel anchor hung from the bowsprit (Concina, 1988: fig. 83; by courtesy of Dr. Ennio Concina).

The single stern rudder is attached, *alla bavonescho*, to the straight sternpost with pintles and gudgeons. Note the shape of the rudder is distinctly different from the galley of Figure 60, which curves beneath the hull along a curved sternpost.

## Frescoes

Figure 63

| | |
|---|---|
| Title: | Unknown. |
| Theme: | Merchant ship at sail. |
| Artist: | School of Giotto, Pace da Faenze (?) (Bonino, 1978 A: 65). |
| Location: | Imola, lost; recorded by Levi (1892: Pl. XXVI, fig. 2). |
| Date: | Mid-14th century (Bonino, 1978 A: 65). |
| General type: | Medium-large round ship (Type IIIb). |
| View: | Starboard profile. |

The details of this representation of a decked and armed merchantman must be considered with due caution, since the fresco has not been preserved, and the only evidence we have for it is a rather problematic rendering of the fresco recorded by Levi in 1892.

The ship is shown under sail, with two lateen sails. The yards of its two sails are arranged wing to wing, with one inclined to port and the other to starboard. The wind, therefore, is coming directly from the stern.

Several aspects of Levi's sketch are questionable. The midships sail is shown as being composed of square sections of cloth sewn together, similar to a much earlier ship, Figure 8, which is probably a square-rigged vessel. Most contemporaneous depictions of lateen-rigged ships that detail lines on sails, show vertical lines (the figs. on pp. 50, 52, 64, 77, 79, 155, 167, 182, 200, 202, and 208). Not one example of this catalog shows similar horizontal lines, a fact which suggests that Levi erred in his recording of the then fading fresco. A more likely interpretation is that the fresco represents the mixed-rig vessel which first appeared in the mid-14th century, with the main mast rigged with a square sail, and the mizzen mast aft fitted with a lateen sail. This would also explain the presence of the high forecastle on the ship, a common feature on square- or mixed-rigged ships (cf. Bonino, 1978 B: fig. 10), but never seen on the earlier purely lateen-rigged ships.

Another suspect feature of this depiction is the height and position of the crow's-nest at the top of the mast. The total height of this mast seems inadequate for either a square- or lateen-rigged mast,

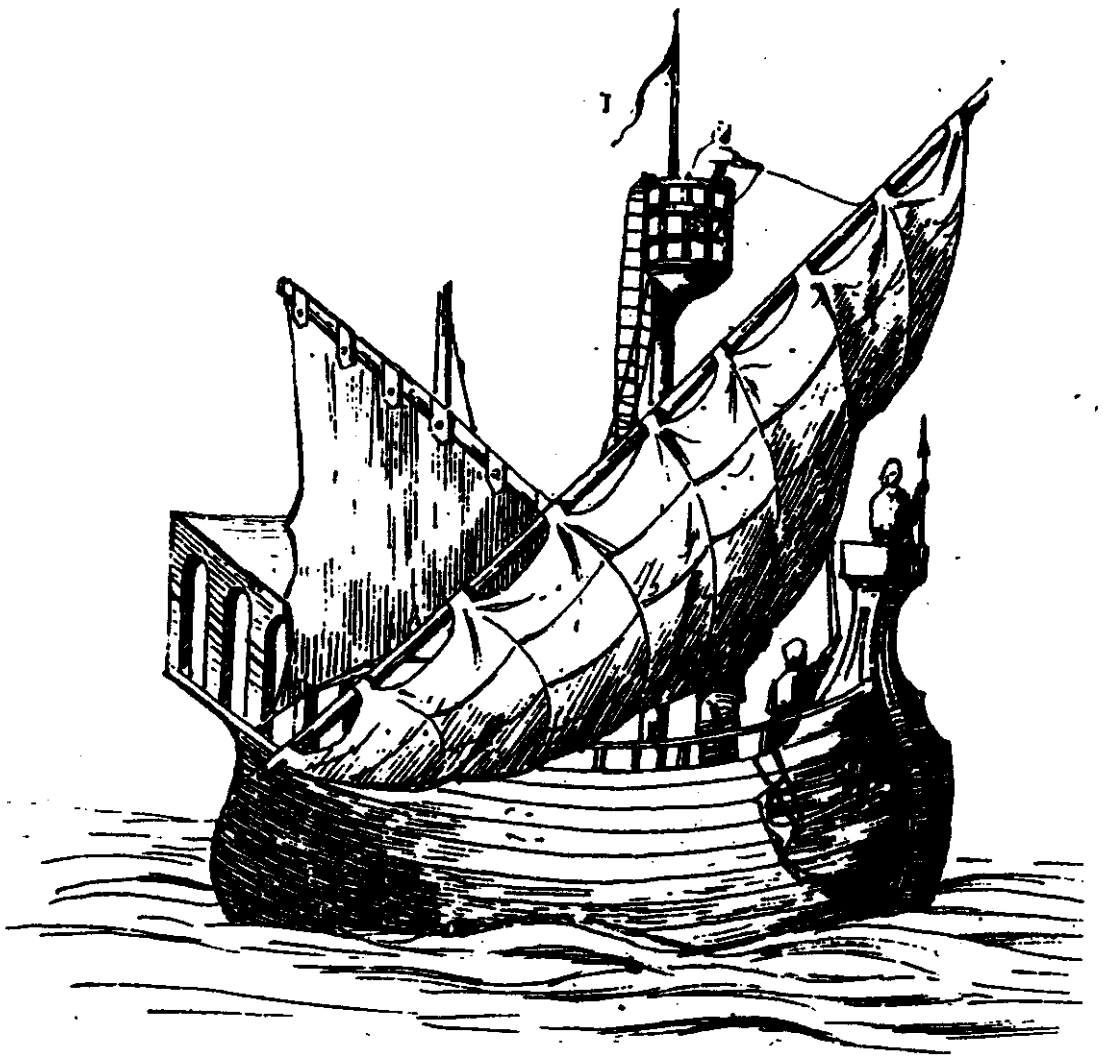


**Figure 63** Imola of Faenze fresco by the school of Giotto (Levi, 1892: Pl. XXVI, fig. 2).

and the position of the crow's-nest, set forward on the mast instead of aft, would have made a tacking manoeuvre difficult, if not completely impossible.

The sails are shown as being attached to the yards with thin sections of the sail cloth brought around the yard and grommeted closed. This also seems implausible. In other representations where a sail's attachments to its yard are visible, they are simple robands apparently made of rope or a metal ring.

Very little of the rigging has been detailed. The crow's-nest is reached by rope ladders aft of the mast. From this high vantage point, a mariner, aided by another working a sheet below, hauls the yard up or begins to swing it about. Of the mizzen mast's rigging, only a halyard is shown.

The hull of this ship is full at both bow and stern. The stem curves outward beneath the hawse holes, above which it curves inward, and then upward and out again to support the high forecastle, where a soldier stands guard. No quarter rudders are evident; a single rudder must have been fixed to the stern. Above it is a large, windowed stern-castle, perhaps with two decks.

Strakes are shown running parallel to the keel all the way to the stem and as far can be seen of the stern. No wales are indicated, although a parapet runs above the sheer strake.

A stock-less anchor is shown hung at the bow; its cable passes through the hawse hole and its shank is supported by a rope tied off inboard. According to Bonino (1978 A: 65), this is the earliest example of a grapnel anchor in the Romagna region.

Figure 64 A and Figure 64 B

| | |
|---|---|
| Theme: | The Calling of Peter and Andrew. |
| Artist: | Giusto de' Menabuoi. |
| Location: | Baptistry of the Duomo, Padova. |
| | Figure 64 A- Foreground vessel. |
| | Figure 64 B - Background vessel. |
| Date: | Second half of 14th century (Pallucchini, 1964: 124). |
| General types: | Two medium-sized fishing boats (Type Ic). |
| View: | Port side, from above. |

This fresco by Menabuoi portrays two fishing craft. Figure 64 A, the foreground vessel, has just returned from a successful fishing trip. Inboard are two nets with a catch of small fish, perhaps mackerel and sardines like those caught with drift and lampara nets in Italy to this day (Gunda, 1984: 217).



**Figure 64** The Calling of Peter and Andrew, 14th-century fresco by Giusto de' Menabuoi, in the Baptistry of the Duomo, Padova (Pallucchini, 1964: 124). A) Foreground vessel. B) Background vessel.

The completely flat bottom of these vessels is adequate for lagoonal navigation. Stem and stern rise sharply from the flat bottom, and finish in high and pointed bow and stern roughly equal in height. Flush-laid planking is attached to inner frames in parallel strakes with nails (not visible). As on the Logonovo boat (ca. 1400; see p. 227), alternating frames probably continue through the turn of the bilge.

A, the foreground vessel in Figure 64, shown moored ashore, carries a single, forward-raking mast stepped far forward. The sail is furled on its two-spar yard, still hung on the mast. Robands are indicated, although no rigging details are clearly distinguishable.

Through the angle of view he depicted, Menabuoi has portrayed part of the interior of the hulls. Figure 64 A has a small bi-leveled deck platform at the stern, finished with cross-planking, that is, planking arranged perpendicularly to the keel. A square structure of poles framing the lower of the platforms probably supported an awning, or perhaps was useful in the casting of fishing nets.

A detail of the background vessel, Figure 64 B, is shown in Figure 65. It either had no mast, or the mast is unstepped. Two men, one standing on the small quarter-deck level at the stern, and the other on the upper deck, row, while a third draws their nets.

Menabuoi's fresco of these fishing vessels portrays a type of water craft best suited for use in shallow, calm water: the minimal keel, high ends and low midships draught would make it rather unseaworthy. The detail in his depiction is remarkable. It is also exceptional in showing details on the inside of a small lagoonal craft (see also the fig. on p. 189). Framing, set with a consistent room-and-space, terminates at a strong sheer strake. Floor planking has been set perpendicular to the keel, likewise the small quarterdeck at the stern has cross-planking (see detail, Figure 65). The craft



**Figure 65** Punting or paddling a small fishing craft, detail of Figure 64 B, from a 14th-century fresco by Giusto de'Menabuoi (Vegas, 1966: Pl. XV).

represented is probably the common *burchio* or the *battèllo*, a lagoonal vessel which was sailed, rowed or punted, approximately 10 m. long, 3 m. in beam, and a height at midships of 1.6 m. The *burchio*, which resembled the *rascona* type of the Po, which continued to be used on the Piacenza-Ostiglia of the Po even up until the early 20th century (Bonino, 1978 A: fig. 26). The tonnage may be estimated at 8.87 tons.[32]

Figure 66

| | |
|---|---|
| Title: | Riminese fresco. |
| Theme: | Merchant ship at sail. |
| Location: | From Rimini, now in the National Gallery of London. |
| Date: | 14th century (Bonino, 1978 A: 64). |
| General type: | Medium-sized round ship (Type IIIa). |
| View: | Starboard profile, slightly from bow. |

The single forward-raking mast of this round ship has wooldings at its base and a crow's-nest fitted aft of the mast head. Two spars, lashed together, form the yard, where robands are shown securing the lateen sail. Two tack, vang and four shrouds, with their blocks, are depicted. Another line (possibly the halyard?), passing through a block, runs between the lower end of the yard and the forward side of the crow's-nest. This is the only depiction in this catalog of rigging in this particular position.

Only the most prominent structural timbers are recorded. Assuming the entire hull bottom is depicted, the keel is straight. The rake of the stem is strong, while the stern appears to be a full transom stern and slightly higher than the bow. The uppermost wales are depicted; below the main wale through beams are visible, which indicate a deck level, since they would have supported a deck.

The rudder has been mounted though a modified box mount and additionally secured with a rudder hoist.

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[32] Calculated with the formula 18.36 feet x [.5 (9.83 feet)] x 9.83 feet.

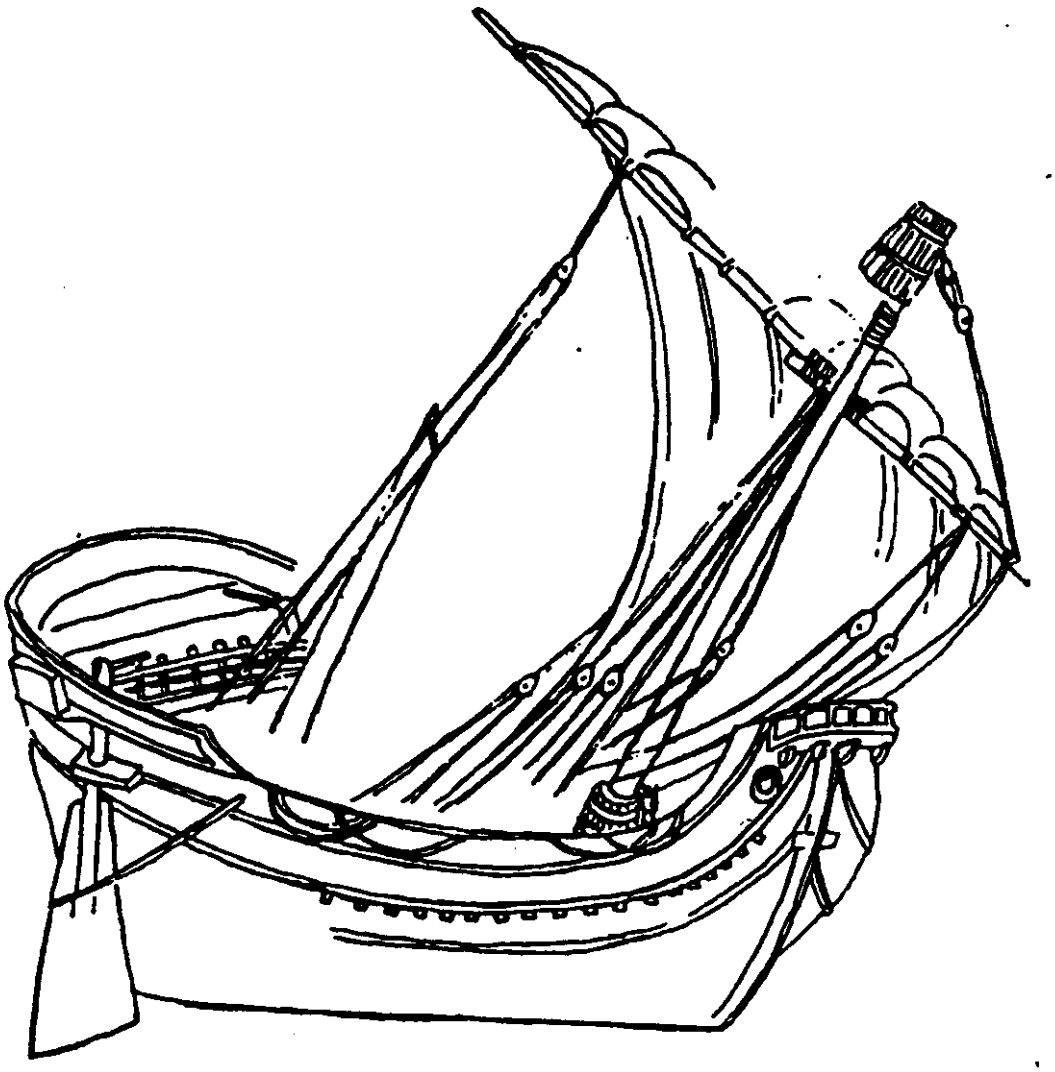


**Figure 66** A 14th-century fresco of a merchant ship at sail, from Rimini, now in the National Gallery of London (Bonino, 1978: fig. 15 A).

Figure 67

| | |
|---|---|
| Theme: | St. Nicholas Saves a Ship in Storm (Nebbia, 1932: fig. 24). |
| Artists: | Bolognese-Riminese school. |
| Location: | Sacristy of Church of S. Domenico, Bolzano. |
| Date: | 14th century. |
| General type: | Medium-sized round ship (Type IIIb). |
| View: | Starboard, slightly from bow. |

This fresco is in an extremely poor state of preservation, showing few clear details. Enough remains to be sure that the fresco represents a lateen-rigged round ship with a high and large rectangular quarter-deck, the fore and aft limits of which were created from continuation of the sheer strakes and possibly the main wale. It has one mast under sail at the bow and part of another is evident aft of midships.

The halyard is sketched fore and aft of the well preserved mast, which inclines forward. The sheave block at the head of the mast is just barely distinguishable, with a crow's-nest set aft of the mast head. Robands secure the sail to its yard. A vang passing through its block twice is also apparent; its fall is being hauled by a mariner at the stern.

The hull itself seems quite full, with a steep rake at bow and stern and a level sheer strake. The full stern represented may be a transom type stern topped with a large, enclosed quarter-deck. Remaining details of the rudder and its mount are too vague to interpret them.



**Figure 67** A 14th-century fresco of St. Nicholas Saving a Ship at Storm, in the Sacristy of the Church of San Domenico, Bolzano (Nebbia, 1932: fig. 24).

Figure 68

| | |
|---|---|
| Theme: | Ship by Molo and Piazzetta of Venice (Nebbia, 1932: fig. 23). |
| Artists: | Unknown. |
| Location: | Church of Misericordia at Lucignano, Val di Chiana (Arezzo). |
| Date: | 14th century. |
| General type: | Medium-sized round ship (Type IIId). |
| View: | Starboard profile. |

Mariners are in the process of securing the ship's sails in port. Unfortunately it is difficult to make out details in Nebbia's reproduction of this poorly preserved fresco, which he interpreted to represent a *tarida* (1932: 43). The placement of the single mast amidships, its near-vertical orientation, the centrally placed crow's-nest, and the equidistant arms of the yard clearly show the ship is square-rigged. Four shroud/stay lines are delineated, two fore and two aft of the mast. The sail itself has been brailed up, and a man forward of the mast releases the halyard. It seems that the mariner on the forecastle is securing the brace to the sternpost, or nearby it.

Figure 69

| | |
|---|---|
| Theme: | St. George and the Princess. |
| Artist: | Pisanello. |
| Location: | Verona, Museo di Castelvecchio; formerly in the Church of San Anastasia, Verona (Kaftal, 1978: 349 and fig. 411). |
| Date: | ca. 1430 (Bonino, 1978 A: fig. 20 B). |
| General type: | Small river cargo boat (Type Ie). |
| View: | Starboard bow. |

The single-masted, lateen-rigged craft depicted in this detached fresco is a rare portrayal of a river or lagoonal cargo craft. Note the flat bottom which continues forward at the rake to form a blunted bow. The central to aft part of the boat is covered. Bonino has interpreted the vessel as being of the *burchio* type (1978 A: 89). Four shrouds, three to starboard and one to port, are evident, as is a sheave block at the head of the mast. Both vang with tackle are secured on the starboard side.

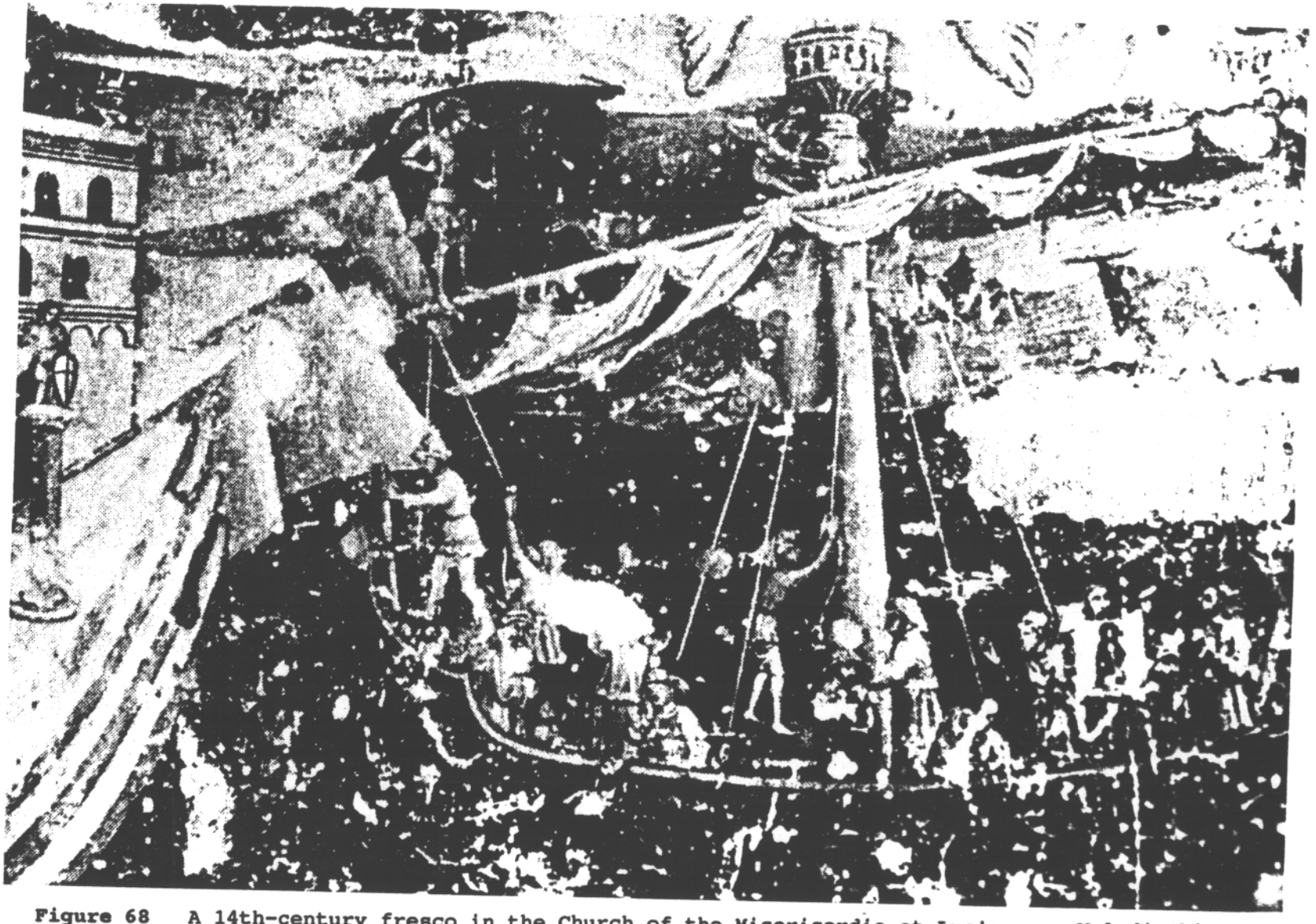


**Figure 68** A 14th-century fresco in the Church of the Misericordia at Lucignano, Val di Chiana (Nebbia, 1931: fig. 23).

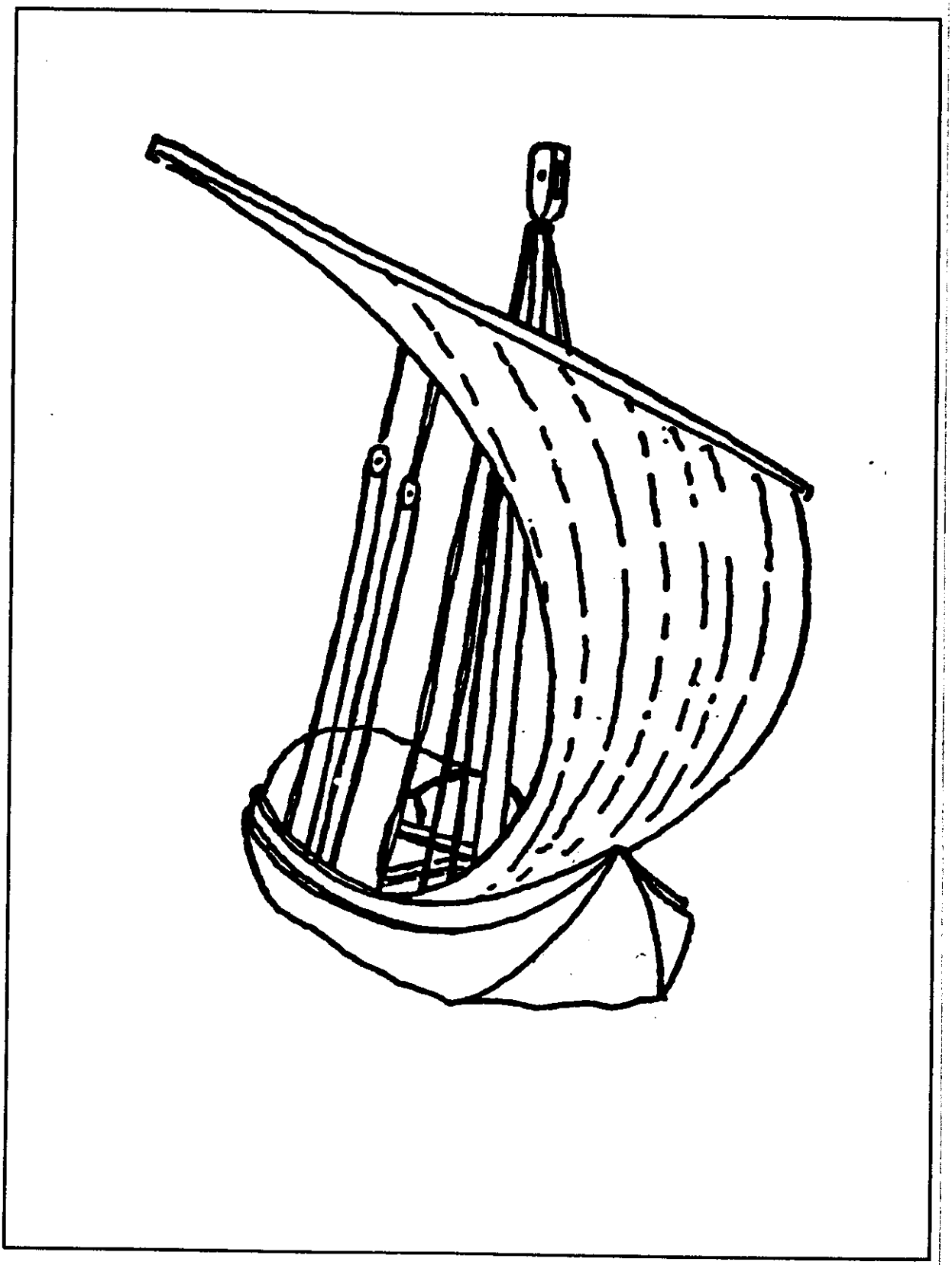


**Figure 69** Fresco by Pisanello of St. George and the Princess, from San Anastasia, Verona, ca. 1430 (Bonino, 1978: fig. 20 B).

Figure 70

| | |
|---|---|
| Theme: | *Vita* of St. Petronius (Bishop of Bologna): he leaves Constantinople for Rome, bearing a message to the Pope from his brother in law, Emperor Theodosius. |
| Artist: | Giovanni da Modena. |
| Location: | Bologna, S. Petronio, Bolognini Chapel (Kaftal, 1978: 861). |
| Date: | Early 15th century (Chastel, 1963: 446). |
| General type: | Medium-sized round ship (Type IIIa). |
| View: | Starboard profile, bow. |

Only the bow area can be seen in Kaftal's reproduction of this fresco (1978: fig. 1135). Although the tall foremast stands vertically, based on its location far forward in the bow, and comparison with the other figures of the cycle (Figure 71 and Figure 72), it is apparently rigged with a lateen sail. The lower part of the sail has been wrapped around the foot of the mast several times to minimize the sail area (cf. Bonino, 1978 A: fig. 12 A). The halyard and vang are the most apparent rigging. Robands are also indicated. The hull has been defined with a few lines depicting a rounded hull, a few strakes, and a decorative parapet around the foredeck. A grapnel anchor is hung horizontally near its hawse hole, crown aft.

Figure 71

| | |
|---|---|
| Theme: | St. Petronius buys relics of St. Florian in Palestine and has them embarked (Kaftal, 1978: 865). |
| Artist: | Giovanni da Modena. |
| Location: | Bologna, S. Petronio, Bolognini Chapel (Kaftal, 1978: 863 and fig. 1140). |
| Date: | Early 15th century (Chastel, 1963: 446). |
| General type: | Medium-sized round ship (Type IIIa) and lighter (Type Ib). |
| View: | Round ship: starboard stern only.<br>Lighter: from above. |

This depiction shows the stern of a round ship. Only one mast is visible, set toward the stern. The furled sail is lateen. Vang, shrouds, and ratlines are depicted. The lashings connecting the two spars of the yard can be seen.

The hull is full and rounded, and supports a quarter-deck at the stern. The excellent view of stern, viewed slightly from above, provides a good picture of the inner construction design of other similar high, rounded quarter-decks at the sterns, such as the figures on pages 124, 158, 182, 186, and 202. The bow and stern of a small double-ended lighter is visible between the ship and shore, but is partially obscured by the relics of St. Florian.



**Figure 70** *Vita* of St. Petronius: He Leaves Constantinople for Rome. Fifteenth century fresco by Giovanni da Modena, in San Petronio, Bolognini Chapel, Bologna (Kaftal, 1978: fig. 1135).

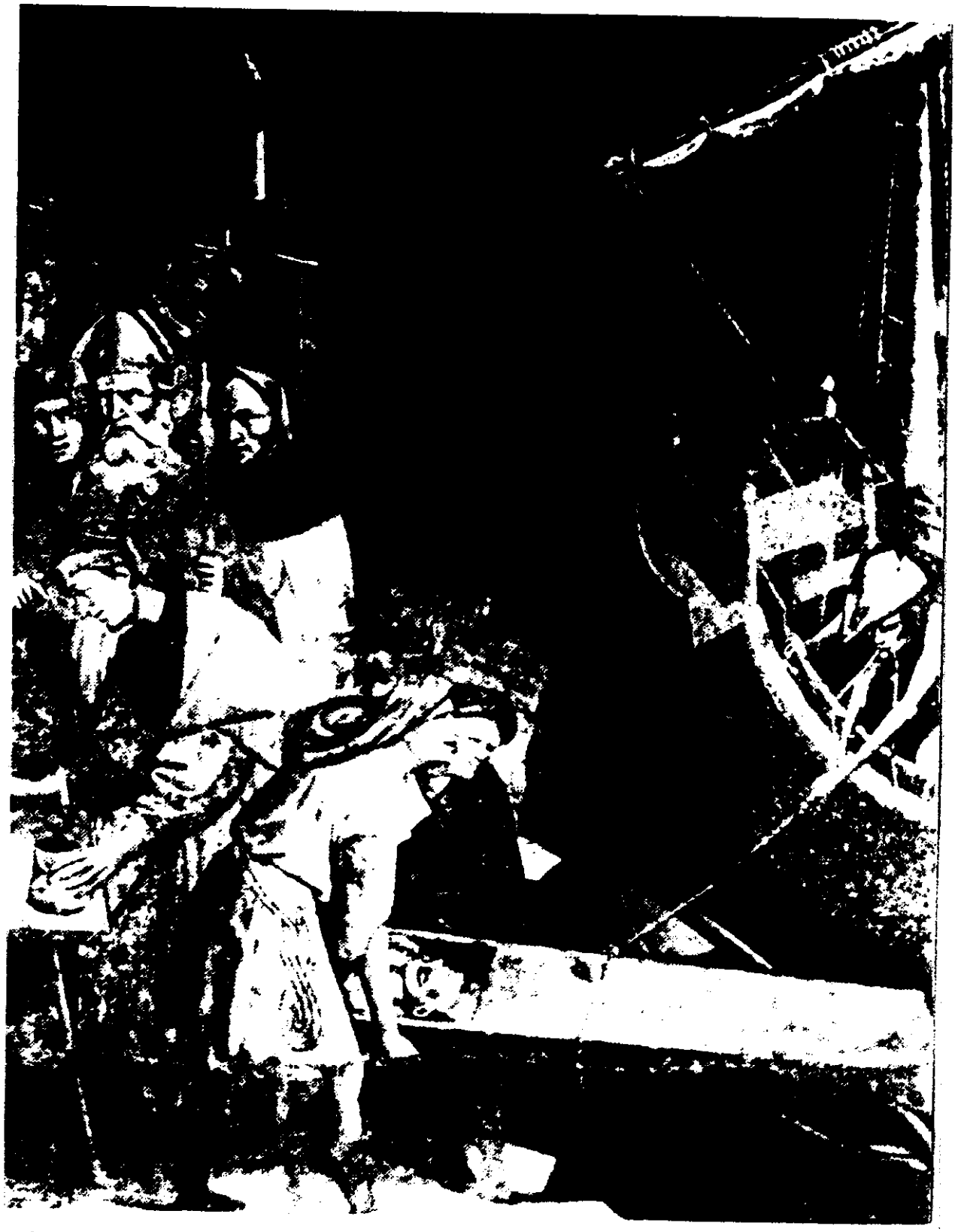


**Figure 71** *Vita* of St. Petronius: He Buys Relics of St. Florian in Palestine and Has them Embarked. Fifteenth-century fresco by Giovanni da Modena, in San Petronio, Bolognini Chapel, Bologna (Kaftal, 1978: fig. 1140).

Figure 72

Theme: *Vita* of St. Petronius (Bishop of Bologna): loading and departure scene.
Artist: Giovanni da Modena.
Location: Bologna, S. Petronio, Bolognini Chapel (Nebbia, 1932: fig. 20).
Date: Early 15th century (Chastel, 1963: 446).
General types: A) a bireme warship (Type IIa), B) medium-sized round ship, to left (Type IIIa), and C) medium-sized round ship, to right (Type IIIa), D) lagoonal craft (Type Ia), foreground, E) lagoonal craft (Type Ia), background, left, and F) lagoonal craft (Type Ic), background, right.
View: A, B, and C) Starboard profiles.

This fresco illustrates three types of vessels, one warship, two round ships, and three lagoonal craft. Figure 72 A, the warship in the foreground is a bireme in the process of loading; note the ramp to shore. On the quarter-deck, surrounded by a parapet, a three dimensional frame supports a tent and pennant.

Both round ships have stays, halyard, robands, vang and tack visible. Figure 72 B, the round ship to the left is just getting under way; a mariner at the top of the mast helps with the manoeuver. In the round ship to the right, Figure 72 C, a mariner hauls on the halyard. The stern and parapet of both round ships are similar to that seen in Figure 71.

Figure 72 D, the lagoonal craft in the foreground, and Figure 72 E, the lagoonal craft in the background, to the left, are both probably the common burchio; note the cylindrical tent amidships as seen in Figure 69. Figure 72 E has a small lateen sail rigged at the bow. Figure 72 F is obscure in the background, but seems to be a small open fishing boat.



**Figure 72** *Vita* of St. Petronius. Fifteenth-century fresco by Giovanni da Modena, in San Petronio, Bolognini Chapel, Bologna (Nebbia, 1932: fig. 20).

## Paintings

Figure 73

| | |
|---|---|
| Title: | *Pala Feriale*, the weekday cover of the *Pala d'Oro*. |
| Theme: | *Translatio* of St. Mark: departure. |
| Artists: | Paulo Veneziano & sons, Luca and Giovanni. |
| Location: | Marciana Museum, San Marco, Venice. |
| Date: | ca. 1343-1345 (Pallucchini, 1964: 36). |
| General type: | Medium-sized round ship (Type IIIb). |
| View: | Starboard bow. |

Ships appear in two of the panels of the *Pala Feriale*, the magnificent painted altarpiece cover for the *Pala D'oro* of San Marco, by Paulo Veneziano and sons. The first is at anchor in Alexandria (Figure 73); the second, in the *passus* of the *translatio* scene (where St. Mark averts shipwreck), is shown under sail (Figure 74). The detail in these paintings is remarkable. Decorations on the sail, precise details of robands, rigging, pulley systems, shrouds, two crow's-nests (with a pennant attached to one), anchor cables, as well as details of the ship timbers have been meticulously depicted (see Figure 73, Figure 75).

The anchored vessel is shown from the bow, at an angle, indicating part of the port side as well as the starboard (Figure 73). The ship is incomplete, but enough of the bow is portrayed to indicate that it was lateen-rigged, and most likely two-masted like Figure 74. The visible mast is set far forward, raking forward. Its sail is furled on a yard comprised of two spars fished together, which hangs about 122 degrees off its mast. Ropes secure the cylindrical crow's-nest aft at the head of the mast. A slightly thickened section scarfed at the head of the mast represents a sheave block, also depicted in the Zibaldone manuscript illustrations (Figure 56 and Figure 57).

Much of the rigging is clearly evident: at least three shrouds and the halyard are shown running aft of the mast. Wooldings, the lines wrapped around the foot of the mast, are also carefully depicted. The presence of wooldings indicates the mast was made of more than one piece in section. This either means the ship was quite large, or at the time of its construction, there was a shortage of adequate timber (cf. the figs. on pp. 182 and 191).

Visible elements of the hull structure include strakes, the false stem, and throughbeams. Note the waterway at deck level: one row of straking has been left off the side of the vessel to allow water to run off deck. Strakes are shown running parallel to the sheer strake. As discussed for Figure 28, the near-horizontal sheer strake seems to indicate a broader bow type, instead of finishing as a narrow, pointed

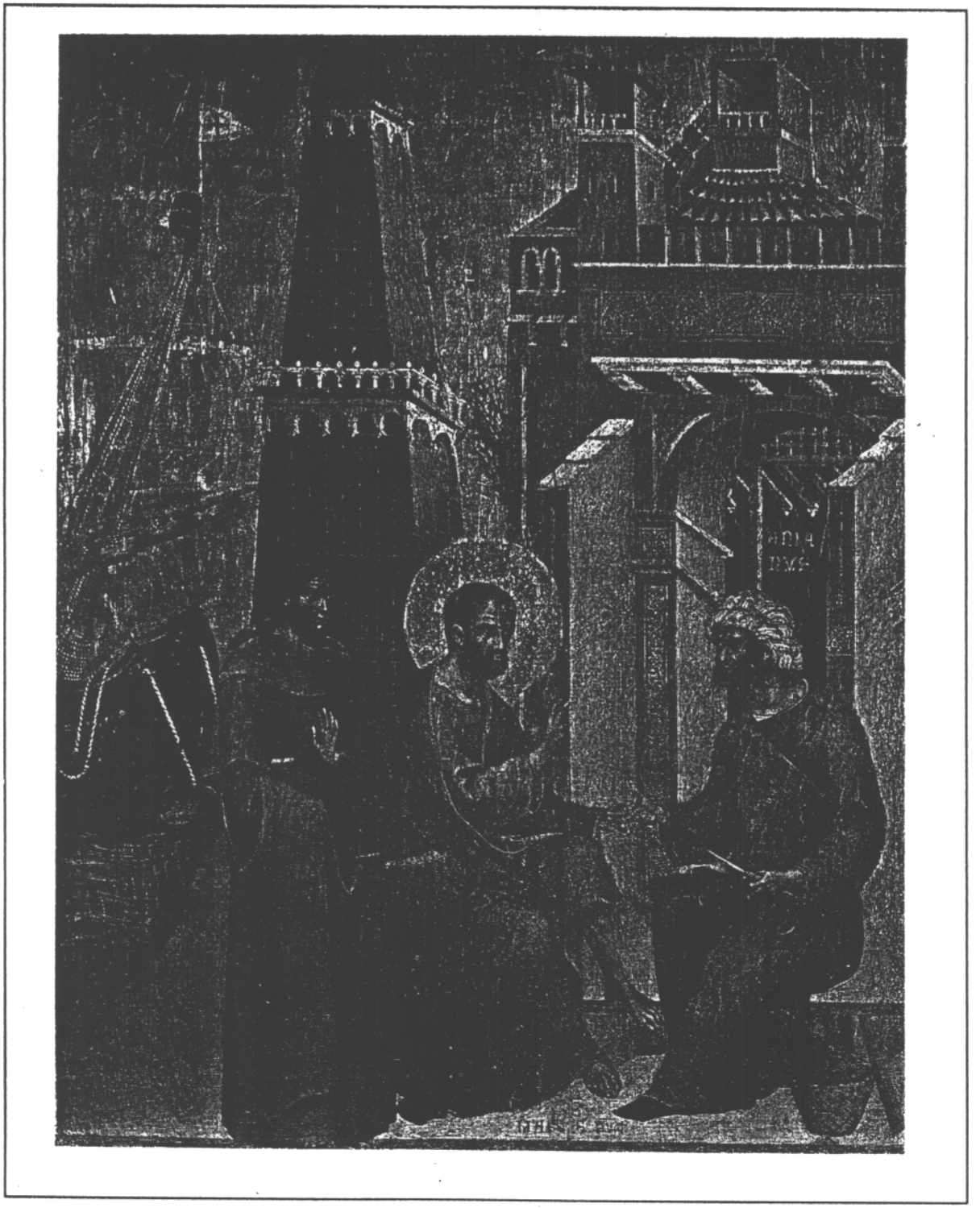


**Figure 73** *Translatio* of St. Mark: Ship at Anchor in Alexandria, detail of the *Pala Feriale* (ca. 1343-1345), Marciana Museum, San Marco.

stem. Hawse holes set high and far forward in the bow on both port and starboard are being utilized by two anchor cables.

Figure 74

| | |
|---|---|
| Title: | *Pala Feriale*, weekday cover of *Pala d'Oro*. |
| Theme: | The *Translatio, Passus* of St. Mark.[33] |
| Artists: | Paulo Veneziano & sons, Luca and Giovanni. |
| Location: | Marciana Museum, San Marco, Venice. |
| Date: | ca. 1343-1345 (Pallucchini, 1964: 36). |
| General type: | Medium-sized round ship (Type IIIb). |
| View: | Partial view of starboard side and stern. |

In the panel to the right, the vessel is depicted from the stern, as it miraculously avoids rocks, which obstruct the midships area. St. Mark's coffin is portrayed on the sheer strake; the saint appears, effecting the miracle, on the quarter-deck.

Of the two masts, only the mizzen is completely visible. Its lateen sail is still set, but the mariners work to lower it quickly. The mizzen mast vang are precisely illustrated: lines from both port and starboard stern run up through their tackle and down again to the deck. Above the tackle, at both port and starboard, the line runs up to tie off to the upper end of the *pennae* of the yard. The deadeye, where the lines were tightened at deck level, can be seen on the port side. The illustration thus accurately portrays a completely functional pulley system. But on this sail, both shrouds are represented as passing behind the sail, instead of to either side of the sail, as should be.

At the stem, the individual strakes, rather than terminating only at the sternpost, run parallel to it, sweeping upwards to a horizontal timber, the tragent, thus forming an ample rounded stern with a quarter-deck (see detail, Figure 75). This quarter-deck is supported by eight vertical exterior frames set perpendicularly to the tragent. A similar stern configuration is seen in the ships of the figures on pages 79 and 202 and represents a type of transom stern.

Two quarter rudders are mounted at port and starboard stern. A rudder hoist, three lines wide, is visible to starboard; it secures the quarter rudder. Nearby, a T- or crescent-shaped anchor with a fixed wooden anchor stock is shown hanging crown aft at the stern, ready to be cast.

---

[33] *MAGR PAVLVS AV ..... SVIS PINXARVT hoc opus.*



**Figure 74** *Passus* of the *translatio* of St. Mark, detail of the painting, *Pala Feriale* (ca. 1343-1345), Marciana Museum, San Marco.

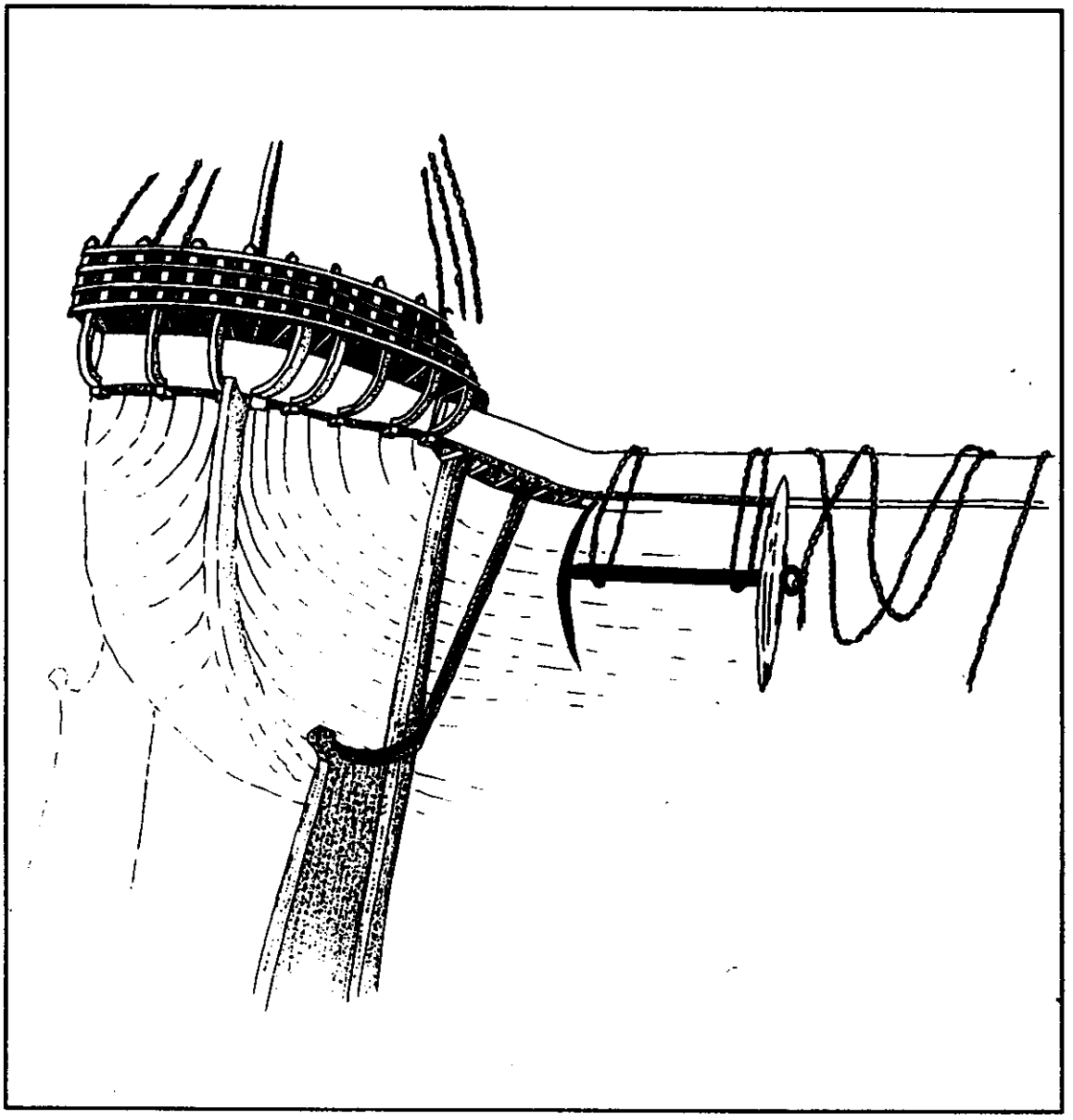


**Figure 75** Detail of Figure 74 (panel of the *Pala Feriale*), showing configuration of planking at stern (Drawing by Helen DeWolf).

Figure 76

| | |
|---|---|
| Theme: | St. Martin Saves a Ship in Distress (Kaftal, 1978: 699). |
| Artist: | Paolo Veneziano or School. |
| Location: | Polyptych, altar frontal, Chioggia, Oratorio di S. Martino (Kaftal, 1978: fig. 897). |
| Date: | First half of the 14th century (Pallucchini, 1964: 27). |
| General type: | Medium-sized round ship (Type IIIb). |
| View: | Port profile, slightly from bow. |

This medium-sized round ship is quite similar in design to the vessels of the figures on pages 108, 124, 182, and 186. Both masts, fortified at deck level with wedges, are inclined forward; the foremast has broken under the effects of the storm. Sails have already been furled on their yards. Details of the rigging are not discernable in Kaftal's reproduction (1978: fig. 897), although the sheave blocks and crow's-nest at the head of the masts are.

The hull is rounded, with a steep sheer at bow and stem. The bow shape is full, as described for Figure 73. The stern is slightly higher than the bow, and has a quarter-deck.

Figure 77

| | |
|---|---|
| Title: | Dyptych, altar frontal, Legend of St. Ursula (Muraro, 1970: Pl. 88). |
| Theme: | *Vita*: St. Ursula and her companions on the ship. |
| Artist: | Paolo Veneziano (Pallucchini, 1964: fig. 47) or School (Muraro, 1970: 145). |
| Location: | Present location uncertain.[34] |
| Date: | First half of the 14th century (Pallucchini, 1964: 27). |
| General type: | Medium-sized round ship (Type IIId). |
| View: | Starboard profile. |

With the exception of its square sail, this ship is almost identical to those depicted in the figures on pages 175, 177, 178, and 180, and may well be a copy by artists within the Veneziano school. Certain details, however, especially rigging, tackle, and the bower anchor, are more clear in this representation. Three shrouds or stays are tied from the head of the mast to the starboard sides and aft. The center line passes twice through its tackle while those to either side of it pass through their tackle only once. Braces with their tackle run from the ends of the yards both forward and aft: the forward brace runs through its tackle once, while the aft one passes through its tackle

[34] According to Pallucchini (1964: fig. 47), this panel is in a private collection in Milan, while Muraro (1970: 145) records it as being in a private collection of Bergamo.

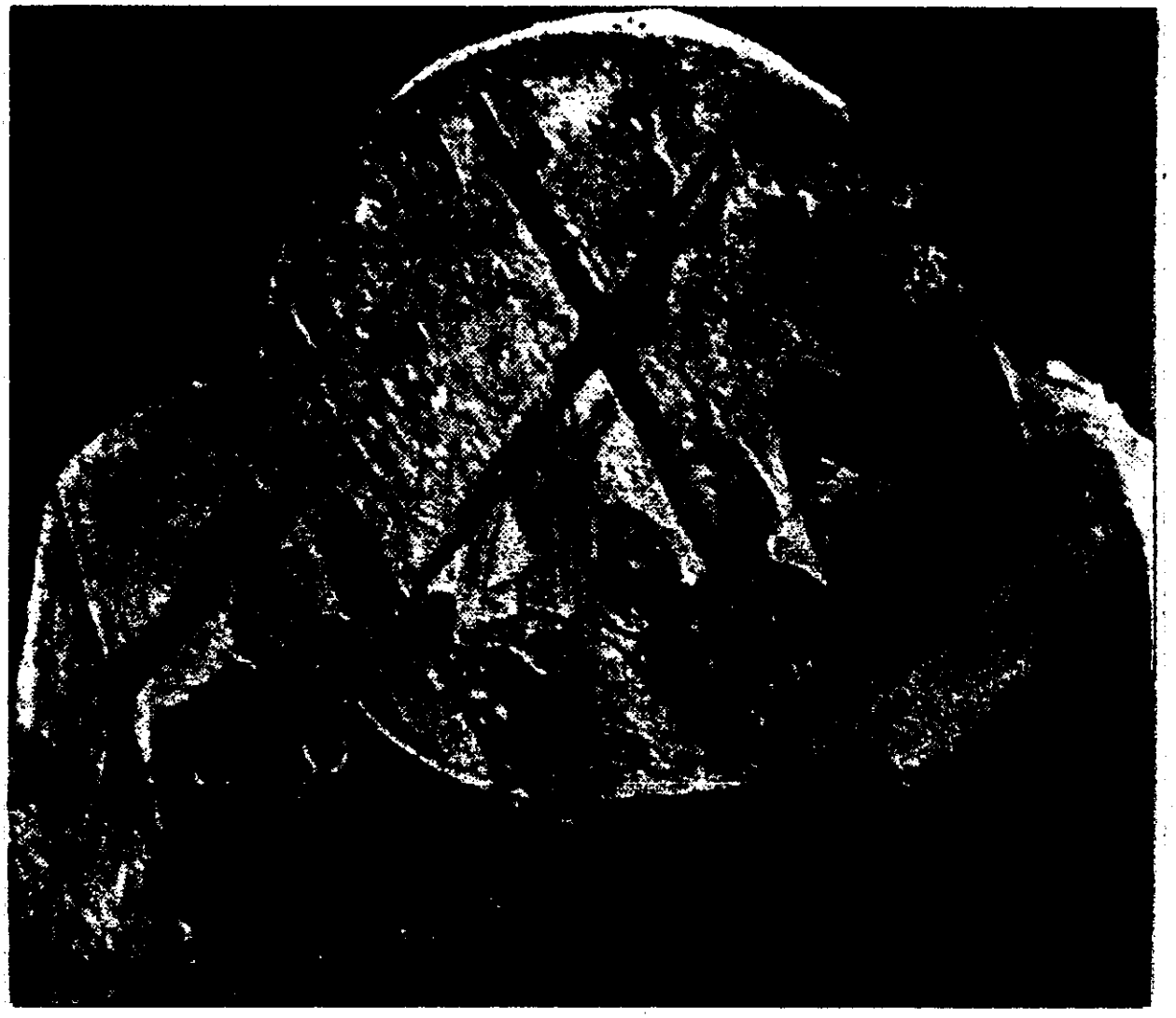


**Figure 76** St. Martin Saves a Ship in Distress, 14th-century polyptych panel by Paolo Veneziano (or School), Chioggia, Oratorio di San Martino (Kaftal, 1978: fig. 897).

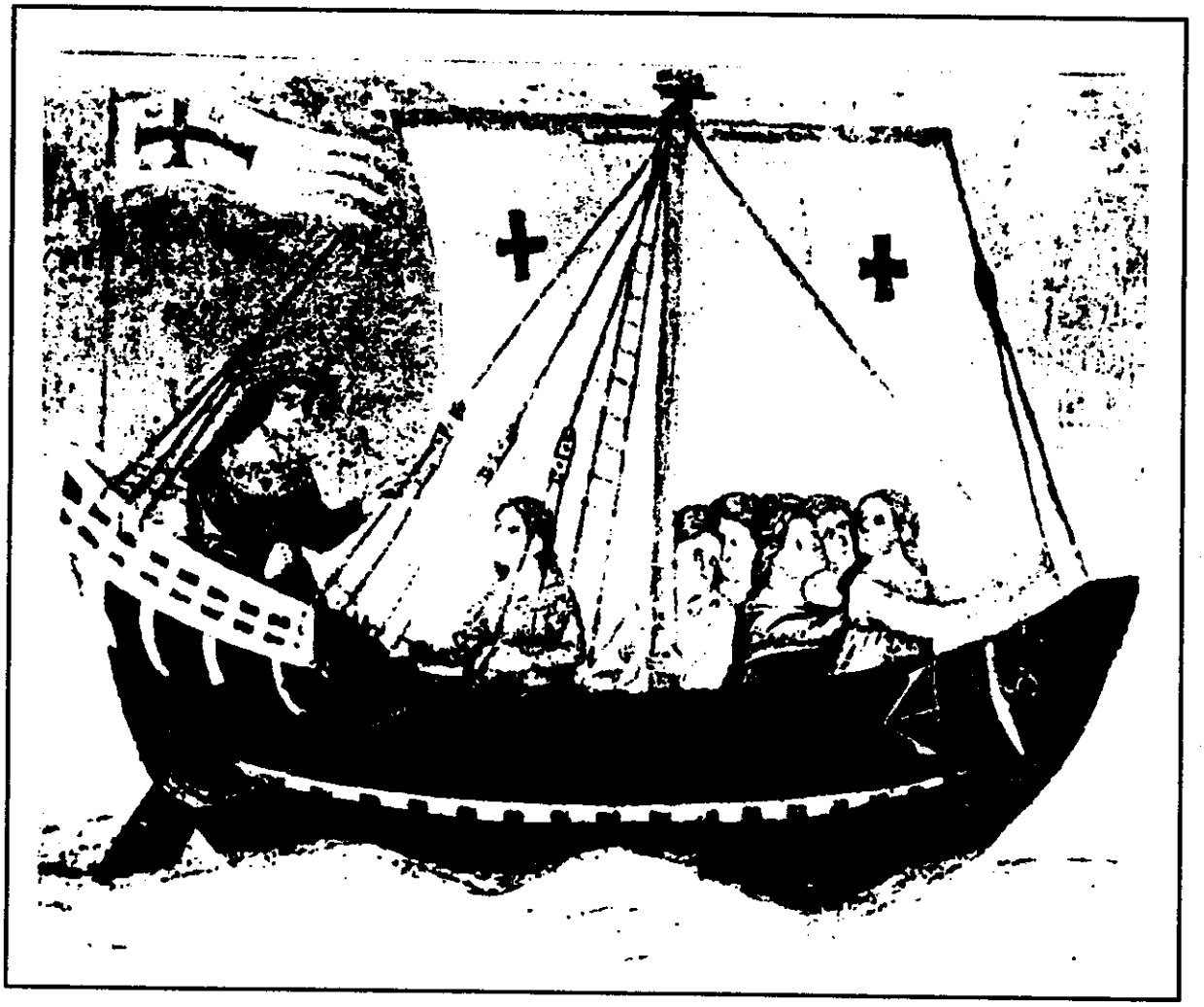


**Figure 77** Panel from a *vita* of St. Ursula by Veneziano (or School), 14th century (Muraro, 1970: fig. 88).

twice. The woman at the bow hauls on a line which probably represents the halyard. A rope rat line behind the mast gives access to the top of the mast (cf. Pryor, 1984, no. 4: 369). No crow's-nest is evident.

The features of the hull and anchor are virtually identical to those described for the figure on page 178. Protruding through beams show the line of the deck level within the hull. Such through beams are a typical medieval feature on round ships, inherited from Roman ship construction techniques (Bonino, personal communication).

Figure 78, Figure 79, Figure 80, Figure 81

| | |
|---|---|
| Title: | St. Ursula dyptych, altar frontal. |
| Themes: | The *vita* of St. Ursula.<br>Figure 78 The Building of Ships for St. Ursula's Journey.<br>Figure 79 St. Ursula and the Virgins Depart; St. Ursula Tells Her Vision to Her Companions.<br>Figure 80 St. Ursula Teaches the Virgins how to Sail a Ship.<br>Figure 81 Arrival at Cologne and St. Ursula's Vision. |
| Artist: | Paolo Veneziano (Pallucchini, 1964: 26), or School (Muraro, 1970: 55). |
| Location: | Present location unknown; previously of G. Volterra (Florence, 1959) and Queiroy Collection (Paris, 1907). |
| Date: | ca. 1350 (Muraro, 1970: 145).[35] |
| General type: | Four versions of a medium-sized round ship (Type IIIb). |
| View: | Starboard sides. |

All four of the panels with ship depictions portray a decked, two-masted, flat bottomed round ship from its starboard side. The first (Figure 78) and third (Figure 80) maritime panels are in direct profile, while the second (Figure 79) includes a partial view of the bow, and the last (Figure 81), of the stern.

Each panel depicts a scene with the same ship, so presumably in all cases the vessel was meant to carry two masts of roughly the same height. The mizzen mast is not clear in Muraro's reproduction of Figure 80 (1970: fig. 84), and no masts have yet been set in the construction scene (Figure 78). In all cases where the masts are in place, it is evident that the mizzen mast is set slightly aft of midships, while the foremast is set extremely far forward. Both masts are lateen-rigged. Figure 79, the only true profile view with masts stepped in place, shows the mizzen mast raking forward at about 14 degrees, while the foremast rakes at 24 degrees. In Figure 80, (and perhaps Figure 79 and Figure 81 as well), it is clear that two spars are lashed together to form the long yards necessary for the lateen sails.

---

[35] Pallucchini dates this painting to A.D. 1321 (Pallucchini, 1964 :26).

A crow's-nest atop each mast is reached via a rope ladder tied aft of the masts. Of the rigging, stays, secured below the crow's-nest, and vang and tack controlling the yards, are depicted. Cross designs decorate the sail in all three versions where the sail is set.

From the construction scene panel (Figure 78), it is clear that the round ship depicted, like the Contarina ship (Contarina I), is completely flat bottomed. The shapes of the bow and stern appear to vary slightly from panel to panel. Since the series presumably intends to represent the voyage of one ship, during preparation, departure and while under sail, probably these differences are due merely to minute changes in the angle of view, each of which reveals slightly different characteristics.

Figure 78 and Figure 80 show a minor projection at the bow. Figure 78, Figure 80, and Figure 81 similarly represent the stem as rising sharply from the keel and ending in a pointed bow. Figure 79 shows a fuller bow area, with a more inward-curving stem (cf. Figure 28), but since part of the port bow is represented here, the perspective is deceiving. Actually the stern is still fuller than the bow, as can easily be seen in Figure 81, where part of the stern is viewed from the rear: The small quarter-deck's exterior is supported by framing perpendicular to a tragent and a transom stern like that seen in Figure 74. Figure 80 minimizes this structure. In all cases, the stem finishes at a height slightly below that of the sternpost, and the ship has a fair curve in profile. Throughbeams project at deck level along the line of the main wale, and are visible in Figure 79 and Figure 81. All main features are comparable to those of the ships of Zibaldone's illustrations (Figure 56 and Figure 57) and Veneziano's other polyptych panels (Figure 73 and Figure 74); all represent a similar type of decked round ship.

In the skeletal view of the ship during construction (Figure 78) a dark, curved structural timber is visible at the stern just above deck level but beneath the quarter-deck. In the others, the rudder passes inboard where this timber would be inside the ship. It is quite likely that this curved hook-like timber is the structural timber which held the yoke of the rudder as it passed inboard, to give internal support to the rudder system.

The rudder mount system is most visible in Figure 79. Beyond the additional depiction here of a rudder hoist, its characteristics are identical to those of the merchantman in the contemporary *vita* mosaic of St. Isidore, Figure 26.

In Figure 80 and Figure 81, an anchor is catted up at the bow,

with its crown toward the stem.

Figure 78

| | |
|---|---|
| Theme: | The Building of Ships for St. Ursula's Journey. |
| Location: | 7th panel. |
| General type: | Medium-sized round ship (Type IIIb). |
| View: | Starboard profile. |

The first maritime panel of this polyptych represents a building scene during the intermediate stages of construction: the keel, posts, the fourteen frames and a main and secondary wale have been set, and a small quarter-deck built at the stern (Figure 45 shows two round ships in a subsequent stage of construction.). Two carpenters bore holes in a frame and the sternpost with their augers; the shipwright between them sketches plans on the ground. From above, two men employ adzes to finish off the timbers.

At the stern is a small quarter-deck, while apparently the bow will be finished with a broad-bow and horizontal sheer strake as described in Figure 28. The sternpost curves slightly inward, while the stem is straighter, and rises more sharply.

The frames are evenly spaced, although 14 frames is too few for a ship this size (Contarina I, a comparable two-masted lateener, had 58 frames). A few of the lower strakes, running parallel to the keel, have already been attached to the framing with nails. The main wale projects slightly beyond both bow and sternposts. This short projection from the main wale at the bow probably is a bitt-beam to cat up the anchor (cf. Figure 80).

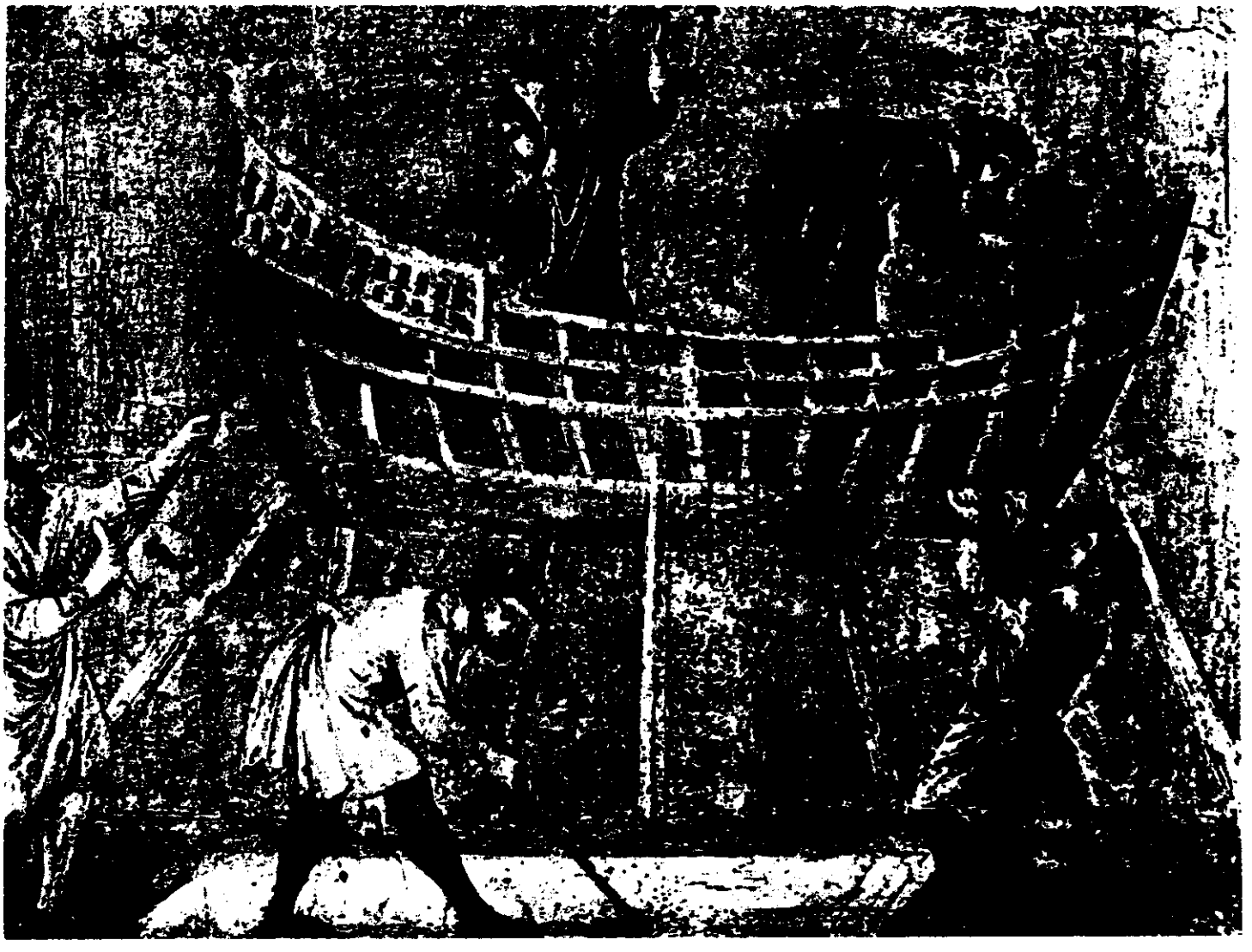


**Figure 78** Seventh panel, *vita* of St. Ursula by Paolo Veneziano (or School), representing ship construction scene, ca. 1321-1350, present location unknown (de Cervin, 1985: 21).

Figure 79

| | |
|---|---|
| Theme: | St. Ursula and the virgins depart; St. Ursula relates her vision to her companions. |
| Location: | 8th panel. |
| General type: | Medium-sized round ship (Type IIIb). |
| View: | Starboard profile. |

This next panel in the series shows St. Ursula and the virgins under sail. On the foremast, at least two stays have been indicated. A rope parrel can also be discerned. The aft-most rigging line of this mast, with its tackle, is probably the halyard; it appears to pass through the *calcet* at the head of the mast. From there, the line runs forward of the mast, down, to support the yard below, and must therefore be the halyard. The woman in the bow holds the tack, carefully defined with its tackle, while St. Ursula works the vang, also defined with its tackle, from the stern.

Of the mizzen, generically-depicted standing rigging lines include the halyard and shrouds or stays. Neither vang nor tack are depicted.

Both masts have a ratline aft for access to the head of the mast. No crow's-nests are evident.

The shape of the exterior sides of the quarter-deck are identical to the triangular-shaped ones discussed for Figure 25, while the bow is the blunted-type discussed for Figure 28.

Figure 80

| | |
|---|---|
| Theme: | St. Ursula Teaches the Virgins How to Sail a Ship. |
| Location: | 9th panel. |
| General type: | Medium-sized round ship (Type IIIb). |
| View: | Starboard side, seen slightly from stern. |

This version of the vessel viewed slightly from above reveals inner framing and confirms that a single deck level exists at the level of the throughbeams better seen in Figure 79 and Figure 81. No mizzen mast has been depicted in this version of the ship. Since a mizzen mast appears in both the previous and subsequent panels, this must be simply an oversight on the part of the artist. The one mast depicted at the bow supports a lateen sail with its halyard, shrouds/stays, and vang and tack line.



Figure 79 Eighth panel, *vita* of St. Ursula by Paolo Veneziano (or School), representing a ship under sail, ca. 1321-1350 A.C., present location unknown (Muraro, 1970: fig. 87).

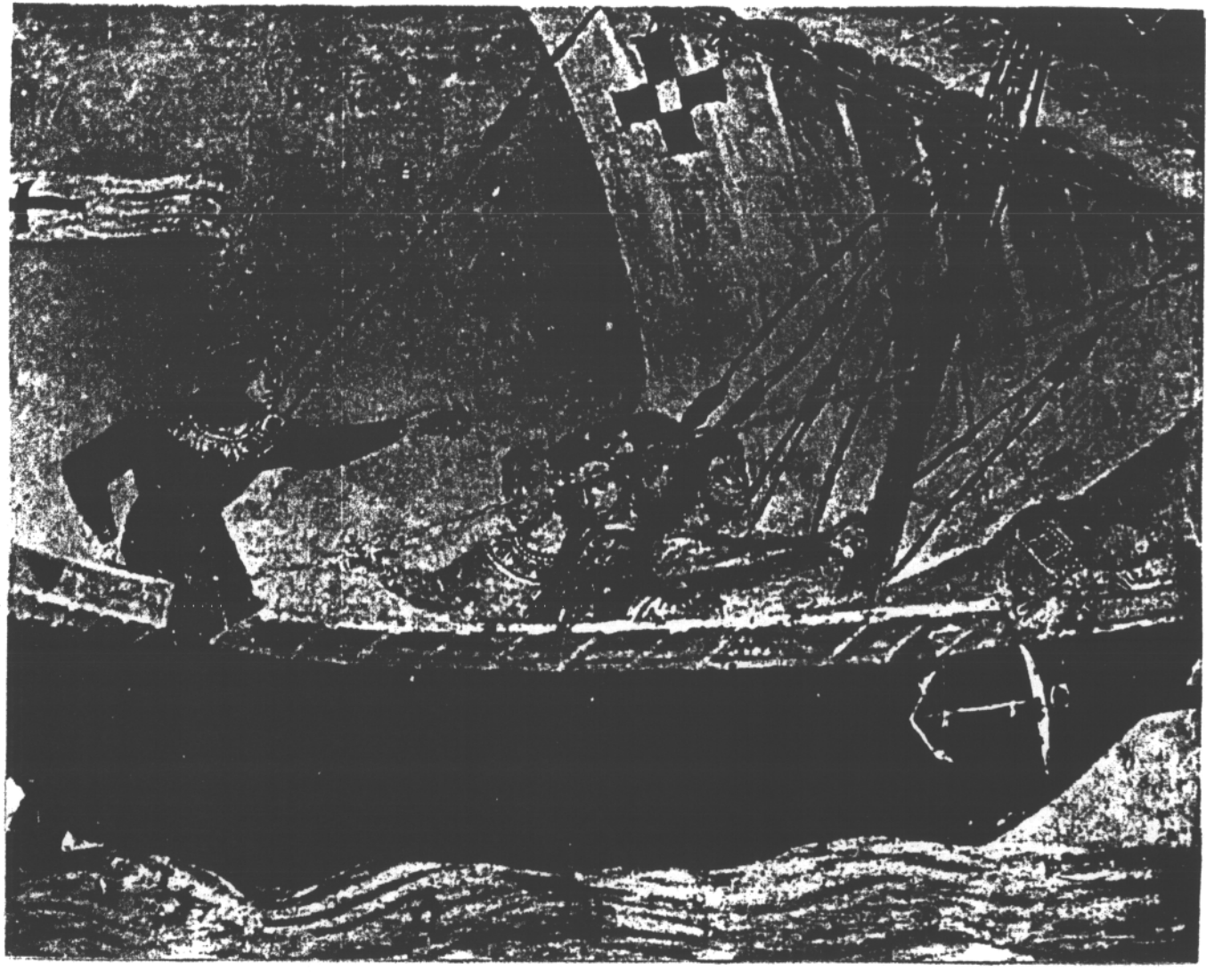


**Figure 80** Ninth panel, *vita* of St. Ursula by Paolo Veneziano (or School), representing a ship under sail, ca. 1321-1350, present location unknown (Muraro, 1970: fig. 84).

In this and the following panel, Figure 80, a crescent-shaped anchor is depicted, catted horizontally at the bow, crown aft, probably secured to the projection of the wale.

Figure 81

| | |
|---|---|
| Theme: | Arrival at Cologne and St. Ursula's Vision. |
| Location: | 10th panel. |
| General type: | Round ship (Type IIIb). |
| View: | Starboard side, seen slightly from stern. |

Reproductions of this series are unfortunately small and dark, although the detail of the rigging in the original painting must be quite good. Three rows of beads of the parrel are apparent, where the yard attaches to the mast. Just above, three lines around the mast are probably the upper ties of the three shrouds visible behind the mast. At the top of the mast, the scarf of the *calcet* is visible, and the halyard and its tackle tied off to the yard in front of the mast. Robands are also carefully depicted. The mizzen vang from the upper end of the yard is tied off either to or near the square stern structure, and the foresail's tack is secured between the bow and midships. A cross decorates the set foresail.

The end of the full stern is shown, revealing that the quarter-deck has perpendicular supports like those seen in Figure 26. The entire stern and quarter-deck structure of the two is actually quite similar.

As in the previous depiction, an anchor hangs at the bow, crown aft.

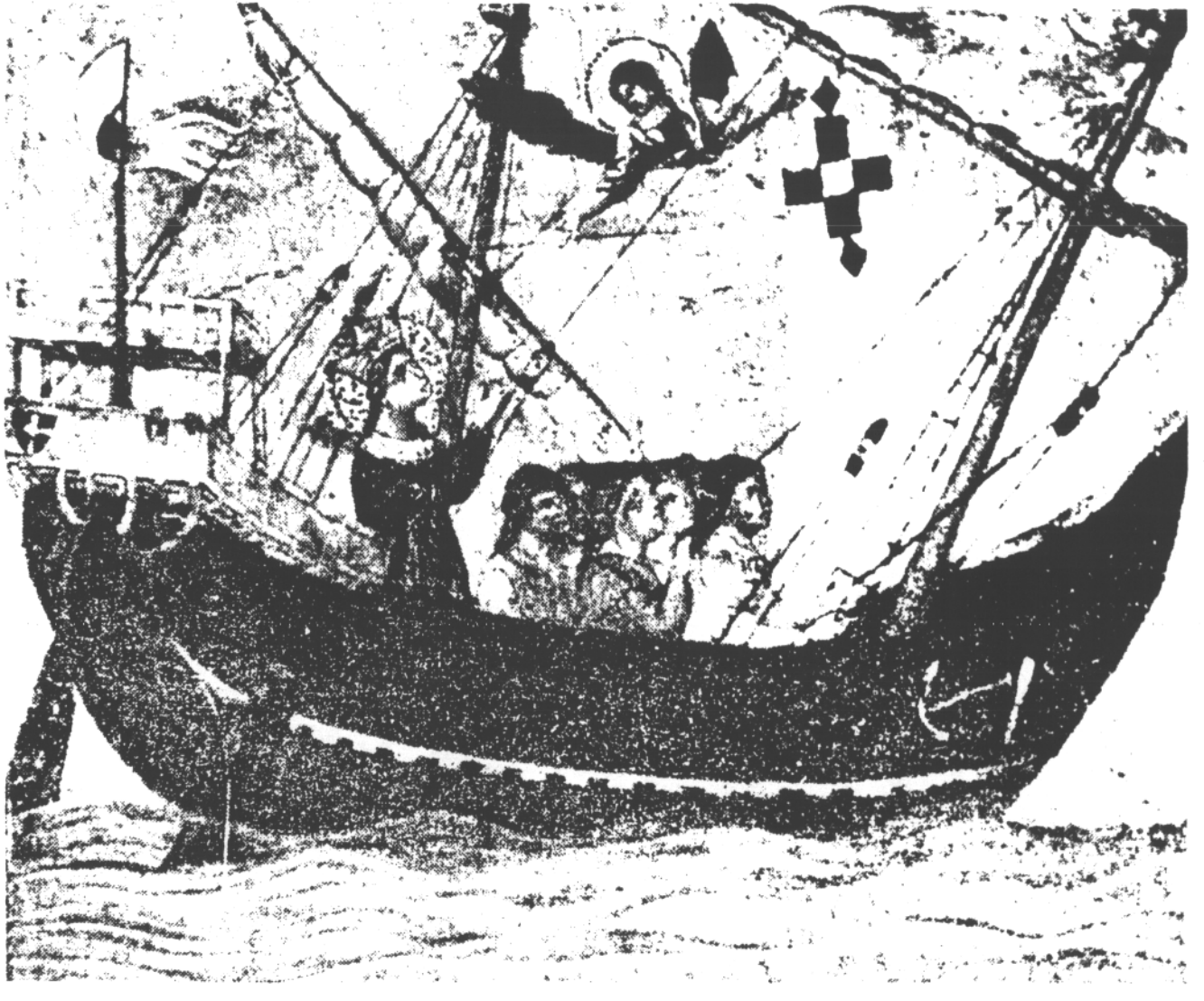


**Figure 81** Tenth panel, *vita* of St. Ursula by Paolo Veneziano (or School), representing ship under sail, ca. 1321-1350, present location unknown (Muraro, 1970: fig. 84).

Figure 82

| | |
|---|---|
| Theme: | St. Peter Walks on the Water. |
| Artist: | Lorenzo Veneziano. |
| Location: | Gemäldgalerie Staatliche Museum, Berlin. |
| Date: | ca. 1368-1372 (Pallucchini, 1964: 173-178). |
| General type: | Medium-large round ship (Type IIIb) and a small lagoonal fishing craft (Type 1c). |
| View: | Starboard profile. |

This round ship shown in stormy seas carries two masts. One, set slightly aft of midships, rakes forward at about 18 degrees off vertical; the foremast is set far forward, raking at about 16 degrees. Wooldings gird the base of the mast at deck level. The yards are attached with rope parrels at the head of the mast; the unfurled lateen sails, hung on their yards with robands, reveal vertical lines, presumably representing seams between vertical bands of sailcloth. Halyard and shrouds with tackle are sketched running from beneath the head of the mast. Vang and tack are indicated for the mizzen sail, though that sail obscures the vang of the foresail. The foresail's tack, with its tackle, is depicted.

The hull is covered by waves, but seems rounded, with presumably a rockered keel. The stern (similar in shape to that seen in Figure 51 and Nebbia, 1932: fig.30) has a raised quarter-deck area and is slightly higher than the bow. A swing rudder mount, though difficult to make out in the dark reproduction, is depicted at the stern.

In the left foreground is a small lagoonal craft identical to the fishing craft illustrated by Figure 83. An oarlock is fixed to starboard with the oar's slot forward.



**Figure 82** St. Peter Walks on the Water, by Lorenzo Veneziano, Gemäldgalerie Staatliche Museum, Berlin, ca. 1368-1372 (Courtesy of the Museum).

Figure 83 A, Figure 83 B, and Figure 83 C

| | |
|---|---|
| Theme: | The Calling of the Apostles. |
| Artist: | Lorenzo Veneziano. |
| Location: | Gemäldgalerie Staatliche Museum, Berlin. |
| Date: | ca. 1368-1372 (Pallucchini, 1964: 173-178). |
| General type: | Three small lagoonal fishing boats and barges (Type Ic). |
| View: | A) Foreground: Starboard side (bow only), slightly from above.<br>B) Background, right: Port side (bow only).<br>C) Background, left: Starboard side (bow only). |

These small craft appear to be flat bottomed, with a gently rising stem. On Figure 83 A, the foreground vessel, planking on the small foredeck is oriented perpendicularly to the run of the keel. Details of the side planking are lost in the photograph of the painting; the original painting may be more detailed. The only visible feature of the hull side is the caprail.

An oar is held by the apostle in the bow; it could be fitted into and held by the typically Venetian oarlock, here mounted to starboard with the oar's slot forward.

Only the bow of a similar vessel appears to the right in the background; the rest of its hull is blocked from view by a rock promontory. The stem (or false stem) of the vessel is visible. The oarlock, though identical in shape to that on the foreground vessel, here is set to port with the oar's slot aft.

In the background, left, is a rare depiction of a *marotta*, a *battèllo* hull with holes, used to keep fish alive in.[36]

[36] I am indebted to Dr. Marco Bonino for his interpretation of this unusual vessel (personal communication).



**Figure 83** The Calling of the Apostles, by Lorenzo Veneziano, Gemäldgalerie Staatliche Museum, Berlin, ca. 1368-1372 (Courtesy of the Museum).

Figure 84

| | |
|---|---|
| Theme: | St. Thomas Becket Sails to France. |
| Artist: | Stefano di Sant'Agnese (?) (Kaftal, 1978: 1273). |
| Location: | Predella panel, San Zaccaria, San Tarasio Chapel, Venice. |
| Date: | Second half of the 14th century (Pallucchini, 1964: 190-194). |
| General type: | Medium-large round ship (Type IIIb). |
| View: | Starboard side, viewed slightly from stern. |

Details are difficult to make out in reproductions of this predella panel (Pallucchini, 1964: fig. 587 and Kaftal, 1978: fig. 1273). It is evident, however, that the vessel is quite similar to the two-masted lateen-rigged round ships depicted in Figure 78, Figure 79, Figure 80, and Figure 81. Note the tackle of the vang and tack tackle (these tackle blocks allow the lines to pass through sheave blocks at least twice, thus greatly increasing the lines' mechanical advantage), and a pair of lines apparently attached to the center of the yard, near the mast. A crow's-nest is set aft on the visible mizzen mast. The heel of the sail has a stylized cross decoration (as does Figure 74, among others). The rudder is attached through a modified box mount.

Figure 85

| | |
|---|---|
| Title: | The History of Alatiel (Pataky and Marjai, 1973: Pl. 7). |
| Artist: | Maestro dei Cassoni Jarves. |
| Location: | Correr Museum, Venice. |
| Date: | Early 15th century? |
| General type: | Two small round ships (Type IIIa); 2 lighters (Type 1b). |
| View: | Starboard profiles. |

In this painting, two round ships are shown in the process of loading, in preparation for a pilgrimage. It is difficult to discern details of either ship because of the excessive gilding of the painting. Some nobles actually did gild the masts and decorate the sails of the ships they supported (Pataky and Marjai, 1973: Pl. 7). Since both ships are identical, the left ship alone has been reproduced in Figure 85.

Stays or shrouds, halyards and vang lines are visible, and the robands securing the sail to the yard. A squared, transom-like stern is barely discernable.

The ornate style of this painting makes it difficult to be absolutely certain of anything, but it seems that horses and their riders are boarding the ship, and are being loaded from the stern. An upright timber above decks at the starboard corner of the stern is visible. The port timber is covered by the horse entering the ship. I believe they should be interpreted as *ali*, structural timbers which



**Figure 84** St. Thomas Becket Sailing to France, by Stefano di Sant'Agnese (?), 14th-century predella panel from San Zaccaria, Venice (Kaftal, 1978: fig. 1273).

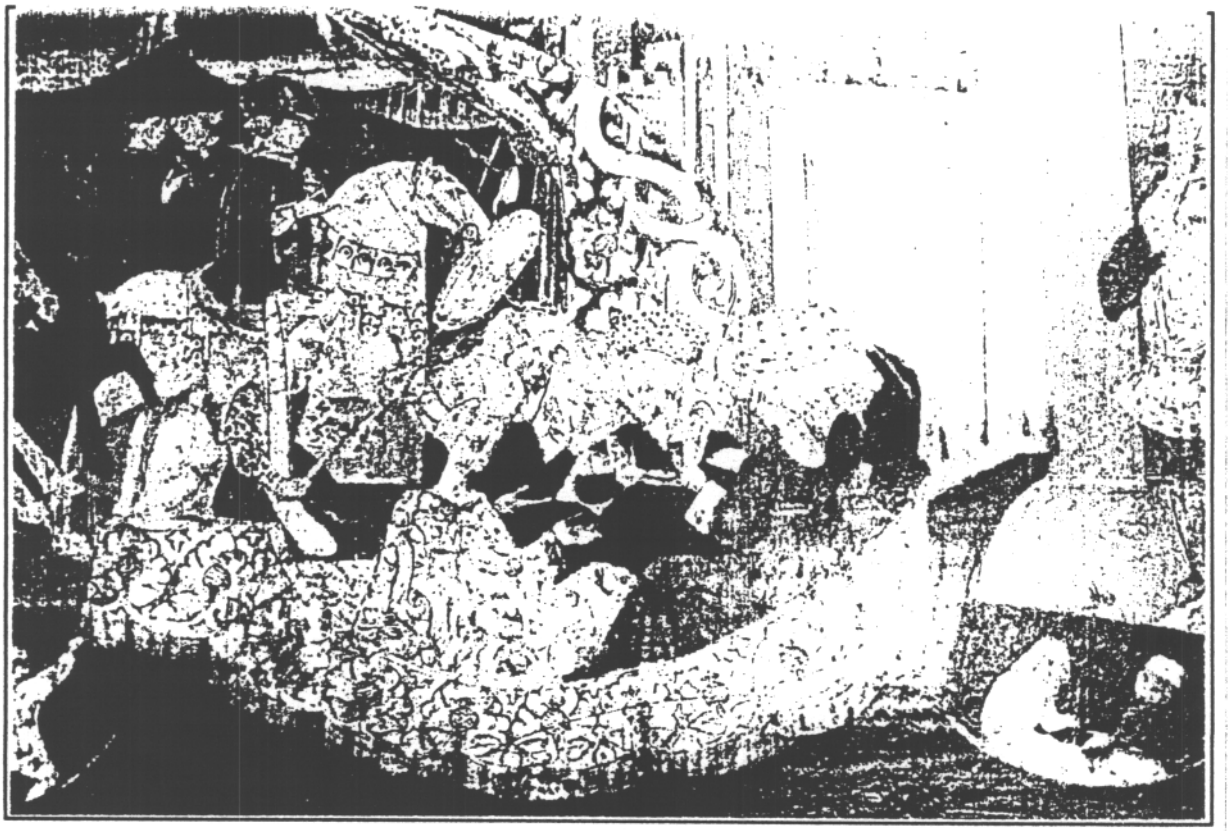


**Figure 85** The History of Alatiel, early 15th-century painting by Maestro dei Cassoni Jarves, Museo Correr (Courtesy of the Museum).

frame the horse port.

The two lighters are very simply rendered with no details beyond a general banana-like form of the hull.

Figure 86

| | |
|---|---|
| Theme: | The Calling of Peter and Andrew (Kaftal, 1978: fig. 1072).<br>Peter Walks upon the Water to Jesus (Kaftal, 1978: fig. 1073)<br>Miraculous Draught of Fishes (Kaftal, 1978: fig. 1083). |
| Artist: | Jacobello del Fiore. |
| Location: | Polyptych panel, Denver Art Museum; originally from the Veneto. |
| Date: | Early 15th-century (Chastel, 1963: 135). |
| General type: | Three similar fishing boats (Type Ic). |
| View: | Starboard profiles, slightly from above. |

The three lagoonal craft in this polyptych panel, each relating different biblical stories (The Calling of Peter and Andrew [Kaftal, 1978: fig. 1072], Peter Walks upon the Water to Jesus [Kaftal, 1978: fig. 1073], and the Miraculous Draught of Fishes [Kaftal, 1978: fig. 1083]) are nearly identical in their details, although two include only the bow area, while one shows the complete vessel. Therefore, only the latter one, depicting the Miraculous Draught of Fishes, has been reproduced in this catalog as Figure 86. The vessel type depicted has a small foredeck as well as a deck at the stern, and also a more gradual sheer, but otherwise is quite similar to the *burchio* type seen in Menabuoi's fresco, Figure 64, or perhaps is the smaller *burchiella*.

The first two depictions show a square hole cut into the foredeck, where a removable mast could stand when sail power was desired. Figure 86 lacks this detail, although it is likely it too would have had a removable mast. Christ stands at the stern, working a steering paddle in the oarlock to starboard. Another paddle is stowed along the port gunwale, secured in it's oarlock.

The keel is apparently straight. Stem and stern rise gently from the flat bottom and finish the double-ended hull with a bow and stern roughly equivalent in height. The angle of view depicted reveals part of the interior hull construction and a consistent room-and-space. Small decks at both bow and stern have their planking arranged perpendicularly to the keel. Framing is fortified with an inner wale or clamp and a sturdy caprail. Floor planking has been set parallel to the keel. A single rudder hung on the sternpost documents the passage from two side rudders to a single stern rudder.

The sharp detail of this painting, its use of perspective, and the definitive affirmation of natural details, already seen in the similar

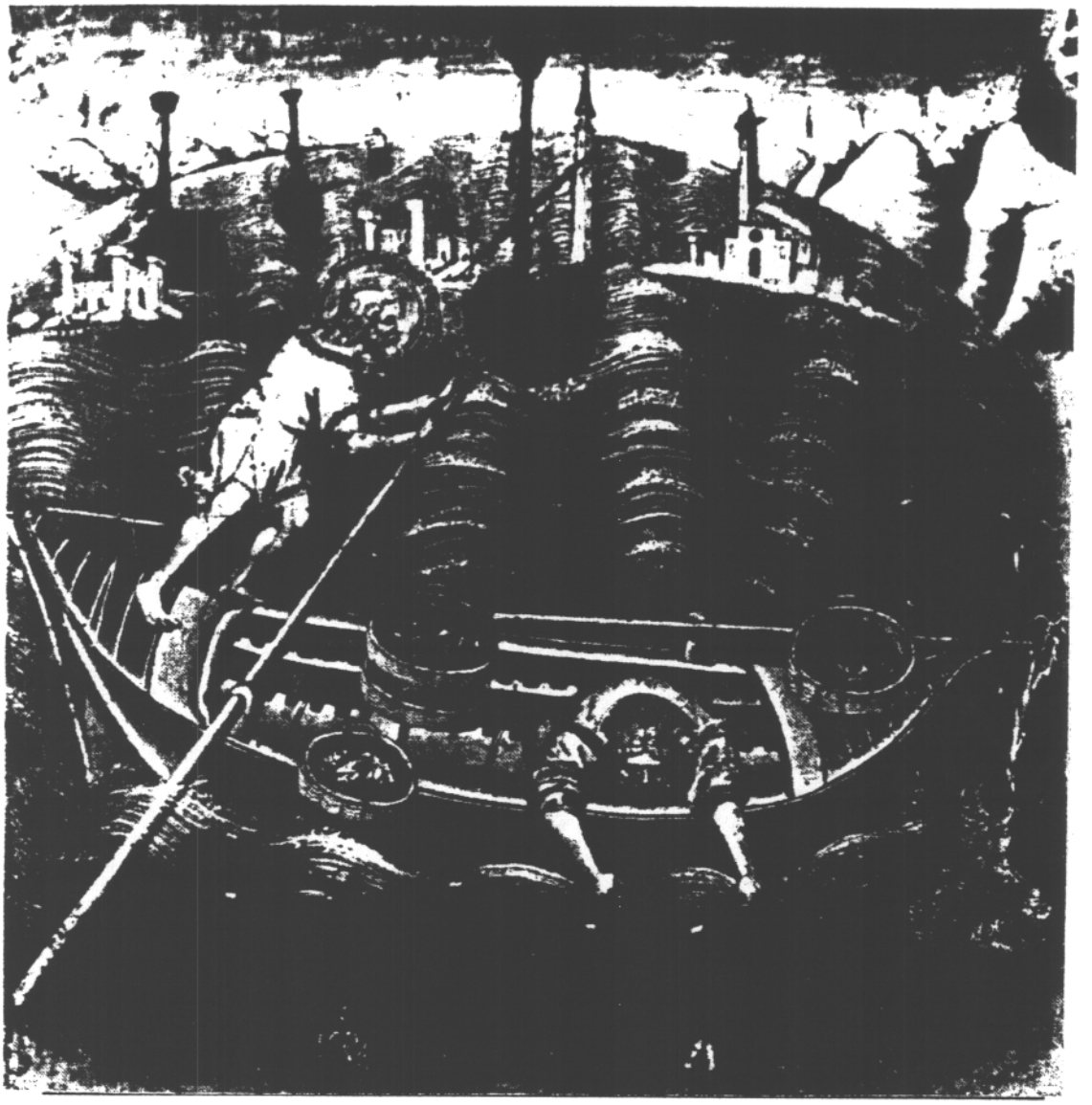


**Figure 86** Miraculous Draught of Fishes, from an early 15th-century polyptych panel by Jacobello del Fiore. Now kept in the Denver Art Museum; originally from the Veneto (Kaftal, 1978: fig. 1083).

craft of Figure 64 make it, too, an excellent point of reference for the small lagoonal fishing craft type.

Figure 87

| | |
|---|---|
| Title: | The Judgement of Paris. |
| Theme: | Round ship careening scene. |
| Artist: | School of Sandro Botticelli. |
| Location: | Private collection, Cini Foundation, Venice. |
| Date: | ca. 1445-1510. |
| General types: | Two large round ships (Type IIId and Type IIIf). |
| View: | Port, from above. |

Figure 87, although half a century later in date than the strict limits of this study, is included in the catalog because it reveals excellent detail of the mixed-rig round ship type commonly depicted in the first half of the 15th century, and shows an unusual scene of a ship being careened. The round ship depicted is of the same type as that depicted in Figure 62, from the first half of the 15th century (Type IIIf). It is shown listing to port, revealing invaluable details of the inner hull construction, the upper deck of the ship, and the techniques used in careening. Figure 88 is the reconstruction by Artù Chiggiato, who based his proportions on the assumption that the ladder in the painting would have measured approximately .75 meters wide x 1.2 meters tall.

The main mast stands slightly forward of midships and rakes only slightly forward; the after mast stands vertically; the small bowsprit-like mast for a lateen spritsail on the forecastle rakes forward at 19 degrees. All sails are stowed. For storage, the after mast's lateen yard has been tied firmly to the base of its mast, and the other end is supported by a transverse timber at the aft end of the sterncastle. The yards of the square-rigged mainmast have been tied, forming a near-vertical "X" about the mast. Eight tackle are visible amidst the numerous shrouds and stays.

The castle at the bow, a small triangularly shaped decked forecastle, is higher than the stern. The stern is also decked, but is flat-ended. Along the port side, the top-timbers visible near where the parapet railing is set, top-timbers are visible along part of the starboard as well, suggest consistent room-and-space. Deck planking runs along the length of the vessel, parallel to the keel, although decking on the sterncastle, and that defined at the forecastle, are cross-planked. A thick beam, projecting through the side of the bow, can be seen above upper deck level and beneath the forecastle. This cathead, called the *arganellum*, was accessible via a small ladder, and would have provided the mariners a place to secure the anchor after

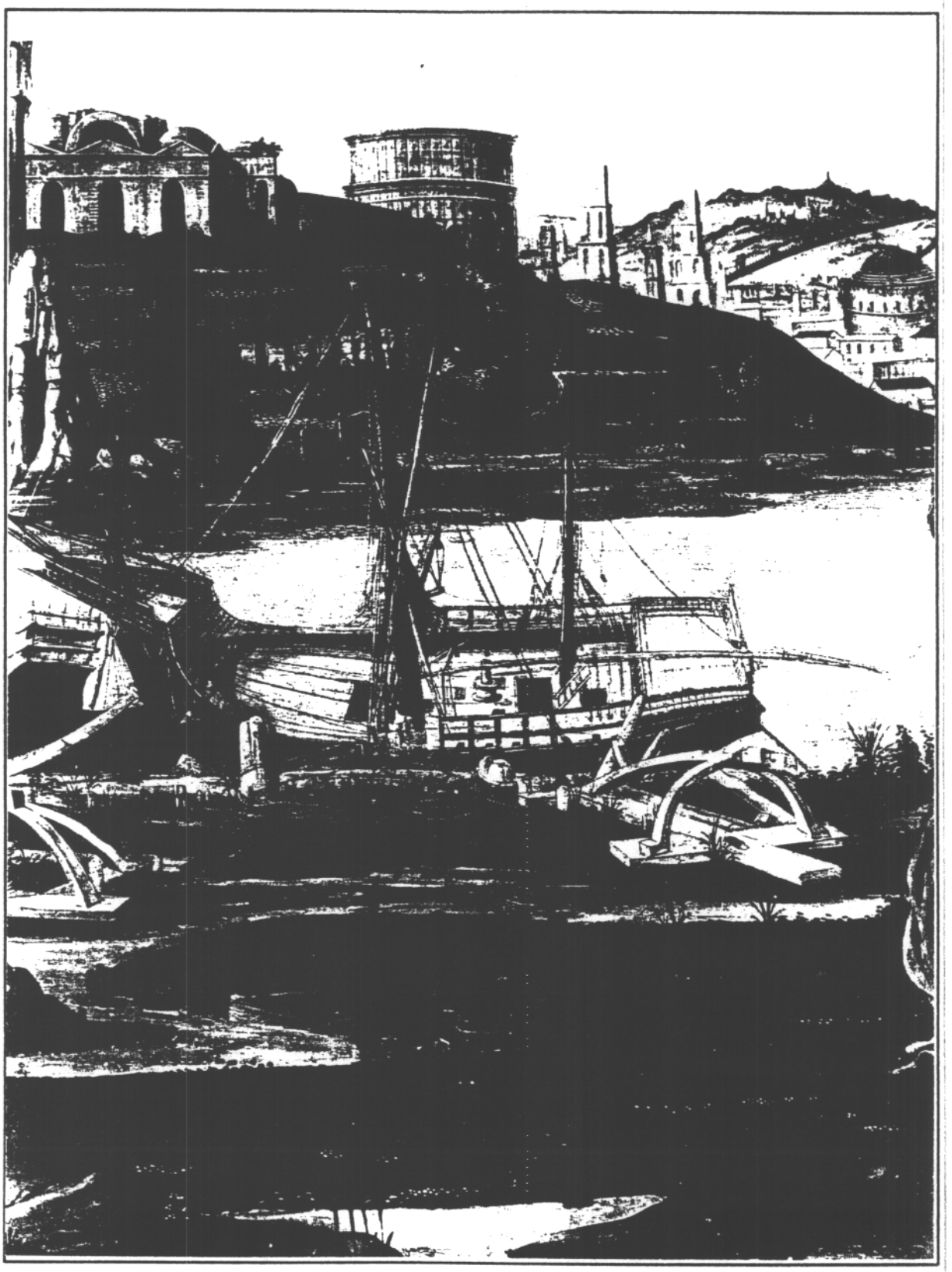


**Figure 87** School of Botticelli painting of the Judgement of Paris (ca. 1445-1510), depicting the careening of a round ship.

catting it up. A capstan can be seen on deck near midships.

This ship post-dates the nautical revolution, being of the mixed-rig type with a stern rudder. The arrangement of the quarter-deck, the parapet, and the placement of the after mast's yard for storage (lashed to the bole of the mast, supported on a transverse timber at the stern), however, are likely to illustrate dispositions on the earlier, completely lateen-rigged ships.

A single-masted cog is in the far background of the painting (not seen in Figure 87).

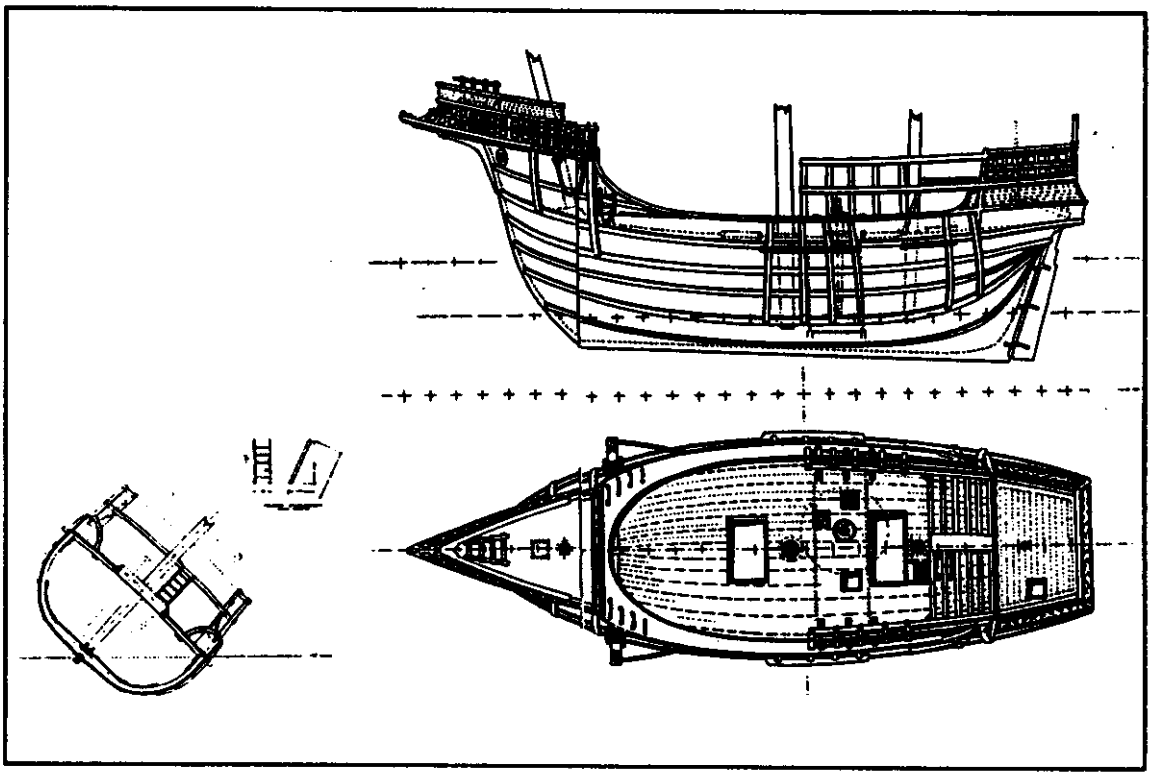


**Figure 88** Reconstruction of a 15th-century mixed-rig round ship by Artù Chiggiato, based on Botticelli's painting, the Judgement of Paris (de Cervin, 1985: 10-11).

## Sculpture, Relief Work in Metal and Stone, and Metal Engraving

Figure 89

| | |
|---|---|
| Theme: | James and John Cast a Fishing Net. |
| Location: | Column of altar canopy of San Marco, Venice. |
| Date: | ca. 7th century. |
| General type: | Two small fishing boats (Type Ic). |
| View: | Starboard profile. |

The northwest column of the altar canopy of San Marco has two small boats sculpted in relief. These small vessels are so simplified that they add little to our understanding of Venetian craft, and only one is illustrated in this catalog. Figure 89 includes a boat with an unrealistic banana-shape, with its ends flaring outward. It is extremely shallow-drafted. The scene depicts the apostles drawing in their nets, and represents a small lateen rig, with a hook-like mast head similar to the one seen in Figure 29, an enamel of the *Pala d'Oro*. No rigging is detailed. The other boat, which depicts Christ Preaching to the Multitudes (not illustrated) is completely unrealistic and even less detailed. It has a saucer shape.

Figure 90

| | |
|---|---|
| Title: | Coin minted in honor of Petrus Candianus. |
| Theme: | Security of Venice under the Doge Peter Candianus (Levi, 1892: Pl. XIII, fig. 2).[37] |
| Location: | Present location uncertain.[38] |
| Date: | 931. |
| General type: | Medium-sized, decked lagoonal and river war boat (Type Id). |
| View: | Starboard profile. |

Jal has translated the inscription on this bronze coin or medallion as "Pierre Candiano, Doge, established *chelandia* at the entrance to the lagoons. Security of Venice (1840: 247)."

Both Levi and Jal have interpreted what actually may be simply a mast set far forward to be a defensive tower (Levi, 1892: Pl. XIII, fig. 2, and Jal, 1840: 247). The lagoonal and river war boat was propelled

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[37] Jal gives more complete information than Levi on the coin's inscription. Around the ship representation: *PETRVS CAND. DVX CHELANDIA* +. Above the ship: *PORTIS*. Below the ship: *C. FECIT*. On the reverse: *SECVRITAS VENETIAE*.

[38] Formerly recorded as belonging to the Zoppetti collection of the Museo Correr, Venice (Levi, 1892: design 30). Personnel of the Correr Museum told me it was not currently in their collections and that they were unaware of its whereabouts. Dr. Marco Bonino saw the medallion in the coin collection of Museo Archeologico in 1966, but he could obtain no record nor photograph of it (personal communication).

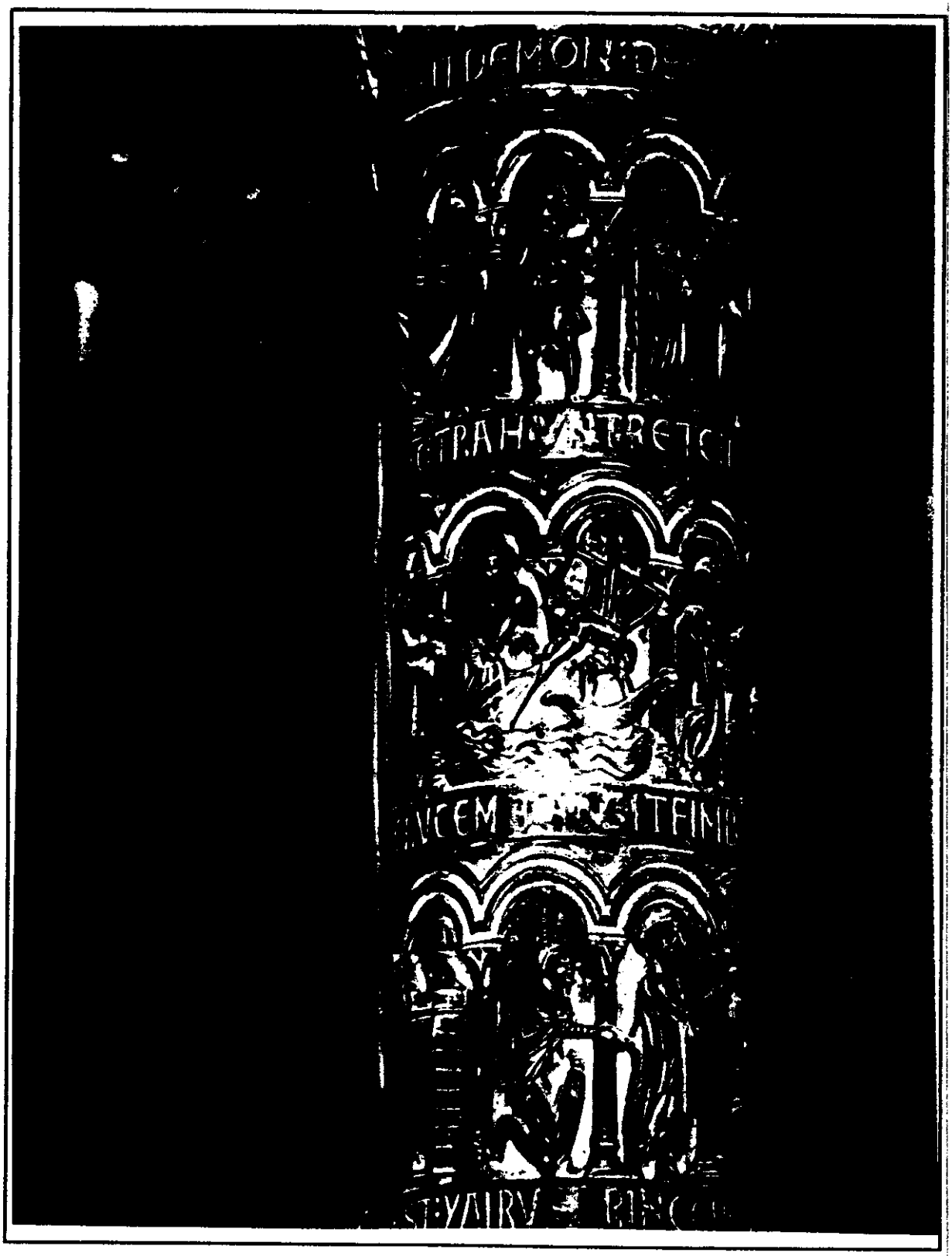


**Figure 89** James and John Cast a Fishing Net: small craft scene from a sculpted column of the altar canopy of San Marco, Venice (ca. 7th century A.C.?).

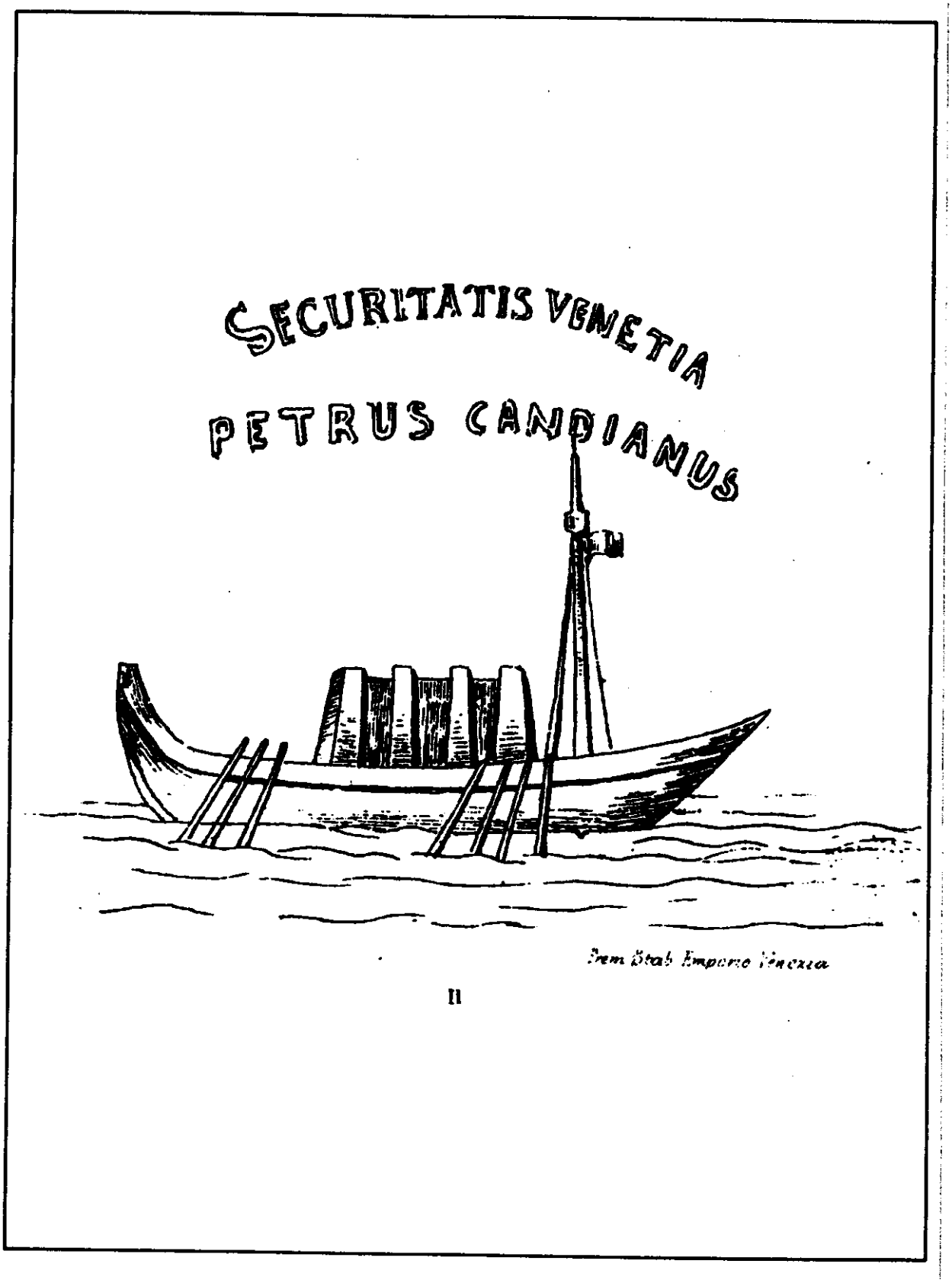



**Figure 90** Coin minted in honor of Petrus Candianus in 931. (Levi, 1892: Plate XIII, fig. 2).

with oars: in the visible starboard side, three are shown near the stern, and four more just forward of midships.

The hull is long, slender, and is likely flat bottomed. The sternpost rises steeply, and slightly higher than the stem. Two lines running parallel from stem to stern indicate either a large wale or extra-wide sheer strake running from stem to the sternpost. A decked cabin at midships extends about a third of the total length of the boat. Oarsmen, probably more numerous than indicated by the number of oars depicted, must have sat on benches between the cabin and the sides of the hull.

Figure 91

| | |
|---|---|
| Title: | Labors of the Months: the craftsmen. |
| Theme: | The ship builders. |
| Location: | Intrados of archivolt, main portal, San Marco, Venice. |
| Date: | ca. 1250 (Dr. Maria Urbani, personal communication). |
| General type: | Small round ship (Type IIIa). |
| View: | Port profile. |

The "Labors of the Months," 13th-century relief sculptures of the main entrance of San Marco represent the ship builders, plank makers, fishermen, and other craftsmen of Venice, and include two vessel images.

Figure 91, a construction scene, portrays one man at the bow of a small round ship boring a hole with an auger. Another at the stern removes an adze from a tool basket, and two men who work from below, caulk with hammer and chisel or a caulking iron. An upper wale, just above the throughbeams at deck level, and a main wale, are indicated. Strakes at the stem have been bound together with rope, probably only temporarily for construction purposes.



**Figure 91** The ship builders, stone sculpture on the main portal of San Marco, ca. 1250 (Muraro, 1985: fig. 73).

Figure 92

| | |
|---|---|
| Title: | Labors of the Months; the craftsmen. |
| Theme: | The fishermen. |
| Location: | Intrados of archivolt, main portal, San Marco, Venice. |
| Date: | ca. 1250 (Dr. Maria Urbani, personal communication). |
| General type: | Small fishing boat (Type Ic). |
| View: | Starboard profile. |

In this relief sculpture, two fishermen, a middle-aged man and a young man, are engaged in two different fishing techniques. The older fisherman, sitting toward the stern in the bottom of the small boat, catches fish with hooks on a line. The younger man, perched on the rim of the vessel at the bow, aims a trident.

Three horizontal lines represent the two uppermost strakes, curving upwards at bow and stern. Consistently spaced nails securing the strakes to inner frames are well indicated. Except for the rise to the stem and sternposts, the small craft has an almost horizontal sheer strake.

Figure 93

| | |
|---|---|
| Title: | *Paliotto* (altar frontal) of San Marco. |
| Theme: | Voyage to Alexandria.[39] |
| Location: | Treasury, San Marco, Venice. |
| Date: | ca. 13th century (Sansoni, 1971: Table CCLI). |
| General type: | Small round ship (Type IIIa). |
| View: | Starboard profile. |

The *Paliotto* is a repoussé sculpture, originally vermeil (silver repoussé work attached to base metal), but now the silver gilt is completely worn away. The remaining metal is, however, well preserved.

The single vertical mast is set far forward with a rake of about 7 degrees. A small crow's-nest, or perhaps a pennant, is at its top. The unfurled lateen sail has vertical lines indicating its seams. Vang and tack are depicted at each end of the yard (a mariner at the bow hauls the tack), and a sheet is tied off slightly aft of midships. The hull is represented with minimal lines, indicating only the sheer, the stem and sternposts, and the wale. A very small quarter-deck with a side railing offers the helmsman a seating platform like that seen in Figure 25 and Figure 91. A mariner seated in this quarter-deck works a quarter rudder by a tiller.

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[39] *Titulus: VALITIN ALEXANDRIA NAVIGIO VEHITUIO.*



**Figure 92** The fishermen, stone sculpture on the main portal of San Marco, ca. 1250 (Courtesy of the Procuratore di San Marco).



**Figure 93** Vermeil *Paliotto* of San Marco, scene from the *vita* of St. Mark: the Voyage to Alexandria (ca. 13th century).

Figure 94

| | |
|---|---|
| Title: | Silver chest of San Simeone of Zara. |
| Theme: | Miracle, *vita*?, St. Simeone of Zara. |
| Artist: | Francesco da Sesto. |
| Location: | San Simeone, Zara, Dalmatian coast, Yugoslavia. |
| Date: | 1377 (Nebbia, 1932: 48). |
| General type: | Medium-sized round ship (Type IIIb). |
| View: | From starboard bow, including starboard side. |

This silver reliquary is made in repoussé. Nothing unusual is to be seen in the portrayal of the round ship's two masts, crow's-nests, lateen sails, rigging or ratlines. This relief represents unusual detail, however, in the hull's construction. The posts rise sharply from the keel. A quarter-deck at the stern has a structure to provide a roof over the helmsman. A hole in the side of the hull allows the rudder stock to be passed inboard.

Instead of joining the stem and forming a completely pointed bow, the sheer strakes finish at approximately the same height as the stem, but a distance away, forming the "broad bow" seen in many other representations and discussed in Figure 28.

The well-defined strakes of the side and bow area run parallel to the sheer, and are fixed with a regular nailing pattern. Presumably the stern would have been constructed as seen in Figure 26 and Figure 74.

Figure 95

| | |
|---|---|
| Theme: | The Calling of Peter and Andrew. |
| Location: | Facade relief, Sant'Andrea della Zirada, Venice. |
| Date: | 14th century (Lorenzetti, 1982: 487). |
| General type: | Small lagoonal fishing boat (Type Ic). |
| View: | Starboard side, slightly from above. |

This simple open craft seems to be flat bottomed and ideally suited for lagoonal navigation. Strakes are generally indicated, as is the typically Venetian oarlock, and a thwart at just below the sheer strake. No other features worthy of discussion are portrayed.

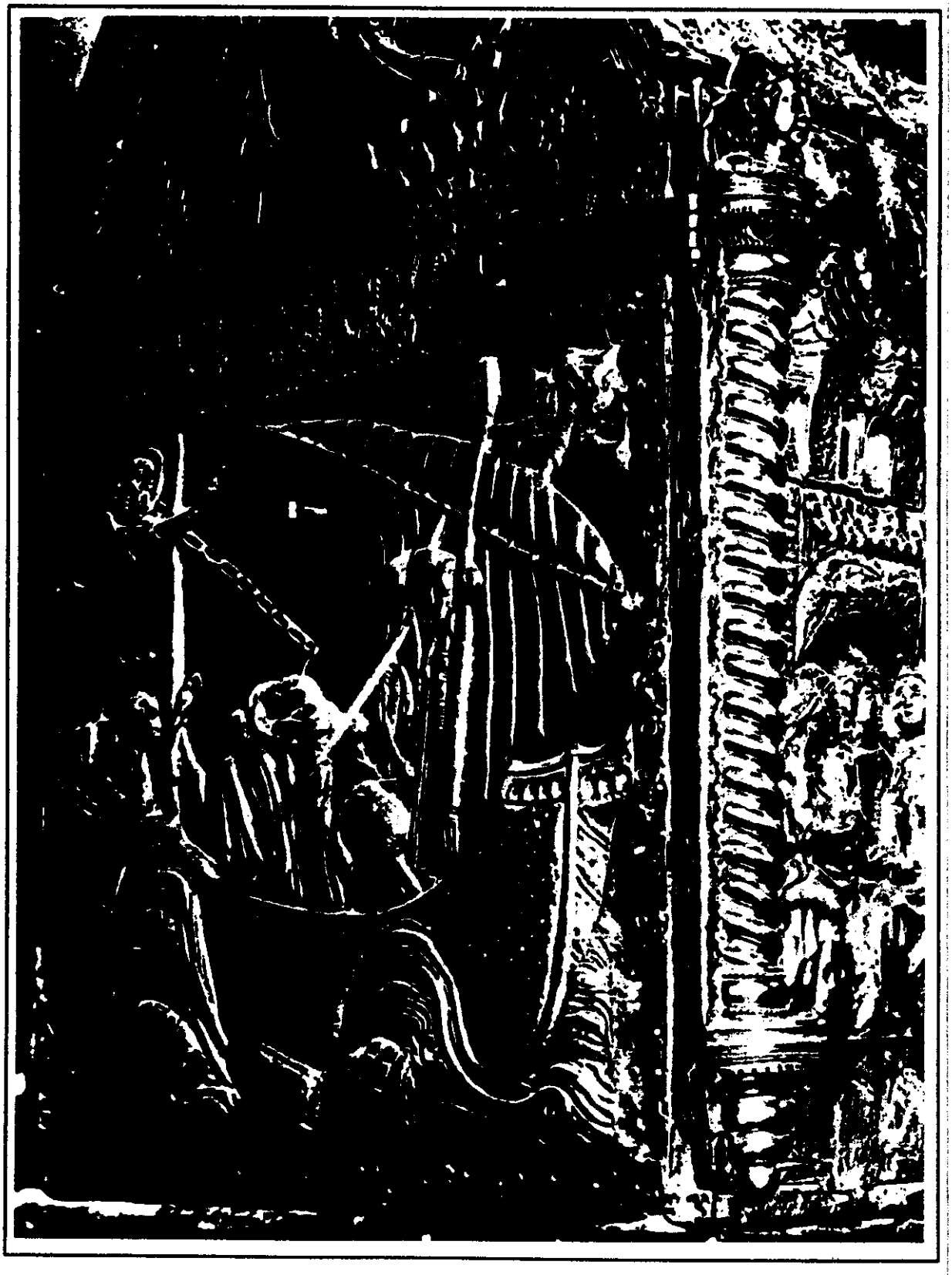


**Figure 94** A silver chest of San Simeone of Zara, 1377 (Nebbia, 1931: fig. 27).



**Figure 95** The Calling of Peter and Andrew, 14th-century facade relief, Sant'Andrea della Zirada, Venice.

Figure 96

| | |
|---|---|
| Title: | Paliotto del Corpus Domini. |
| Theme: | The Calling of Peter and Andrew. |
| Artists: | Paulo and Canterina d'Andrea Bartolomeodi. |
| Location: | Museo Correr, Venice. |
| Date: | Early 15th century. |
| General type: | Small, lagoonal fishing boat (Type Ic). |
| View: | Port side, viewed slightly from above. |

This gilded wood panel polychrome sculpture represents a small lagoonal craft. Besides the typically Venetian oarlock, with its oar's slot aft, nothing is noteworthy in this simple craft. The artist has generically rendered only the main lines: the water line and stem sheer strakes. It looks very much like any rowboat of the present day.

Figure 97

| | |
|---|---|
| Theme: | Votive ship. |
| Location: | Treasury, Toledo Cathedral. |
| Date: | ca. 1430-1450 (Hahnloser, 1971, Pl. CLXXV). |
| General type: | Round ship (Type IIIf). |
| View: | Three dimensional sculpture. |

Figure 97, a votive of gilded silver and rock crystal was made in Venice in the early 15th century. No masts are present, but the vessel type is large enough in proportions to have had at least two masts. Its shape is similar to Figure 62 and Figure 87.

The lower part of the hull has been left plain, with the exception of one wale, but above the main wale, the waterway and rows of straking are defined, as are the upright supporting braces necessary on a hull with tumble home. Like Figure 87 and several other examples, the ship's bow ends in a point, and has a triangular high foredeck, while the ample stern is full, probably a transom. A decorative parapet runs around the foredeck as well as the quarter-deck.

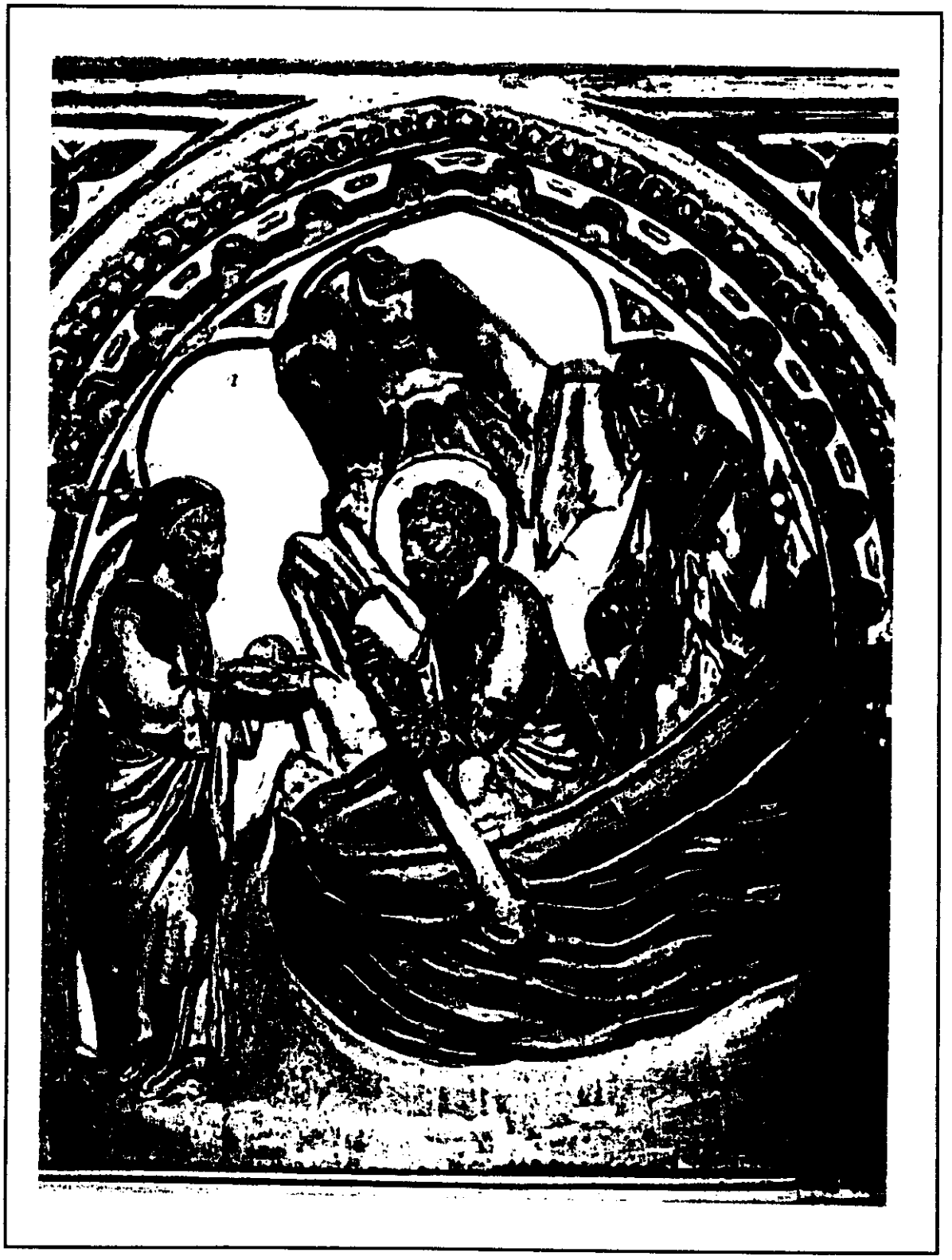


**Figure 96** Paliotto del Corpus Domini, early 15th-century polychrome sculpture by Paolo and Canterina d'Andrea Bartolomeodi, Correr Museum (Courtesy of the Museum).

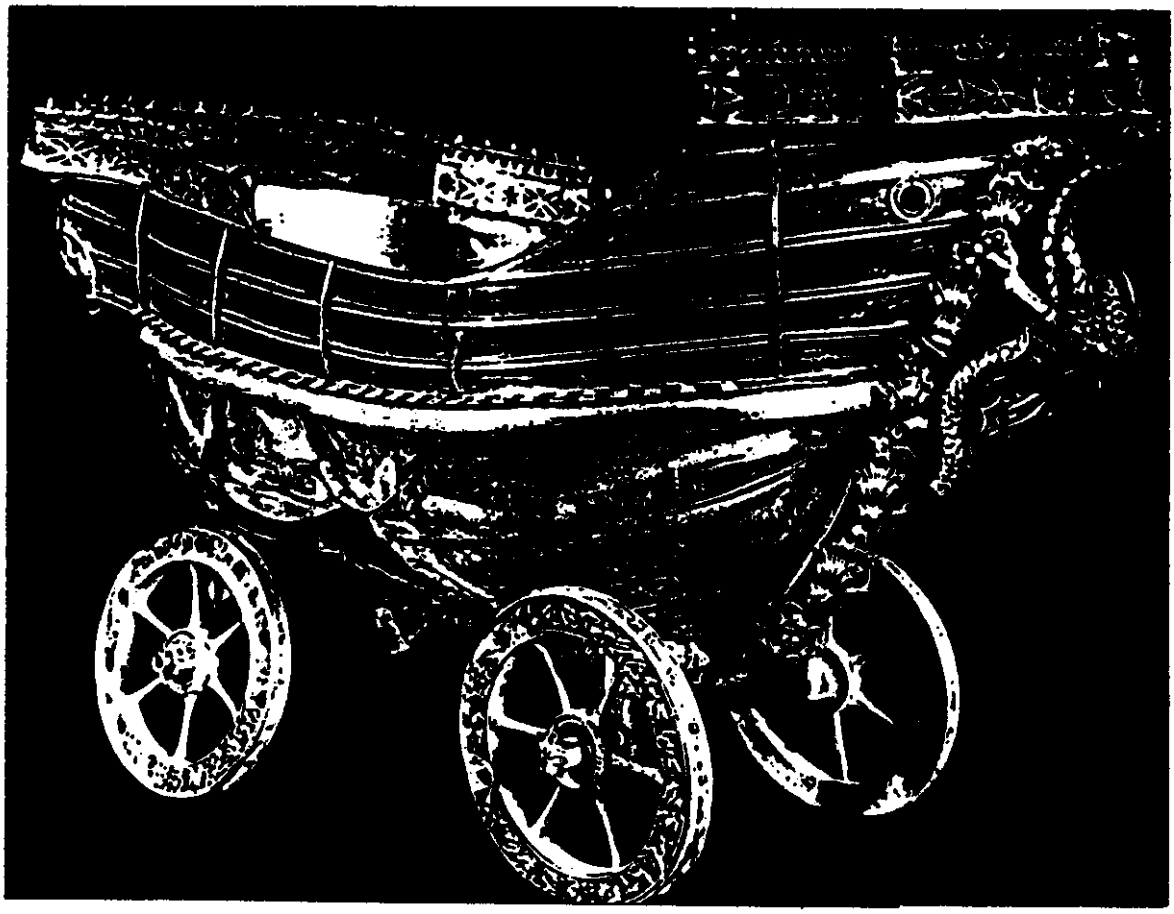


**Figure 97** Gilded silver and rock crystal votive of ship, made in Venice ca. 1420-1430; kept in the Treasury of Toledo Cathedral (Hahnloser, 1971, Pl. CLXXV).

Figure 98

| | |
|---|---|
| Theme: | Galley under sail. |
| Location: | Museo Correr, Venice (Levi, 1892: Pl. XXII, fig. 1). |
| Date: | Unknown, perhaps 15th century. |
| General type: | Warship, oared galley (Type IIa). |
| View: | Starboard side, from bow. |

Although the date of this engraved metal plate is unknown, though it probably post-dates 1450, it is included in this catalog since it is a lateen-rigged vessel, and has features which must have been common to the earlier galleys which are so rarely found in the artistic record.

The galley is powered with approximately fifteen oars per side, supplemented by the lateen sail of the single mast. This mast is set toward the bow. The sail is attached to the yard with robands at the ends of the vertical bands representing the sail's seams. The more visible oars on the starboard side outrigger can be seen arranged all on one level.

Four shrouds are shown to both port and starboard, as are vang and tack clearly defined to both port and starboard, with their tackle. The large sterncastle is roofed and has a lantern affixed on its ridge, far astern. The vessel was no doubt navigated with a single stern rudder (not visible). At least six guns arm the ship at starboard bow; the port side of the bow is obscured by the sail.

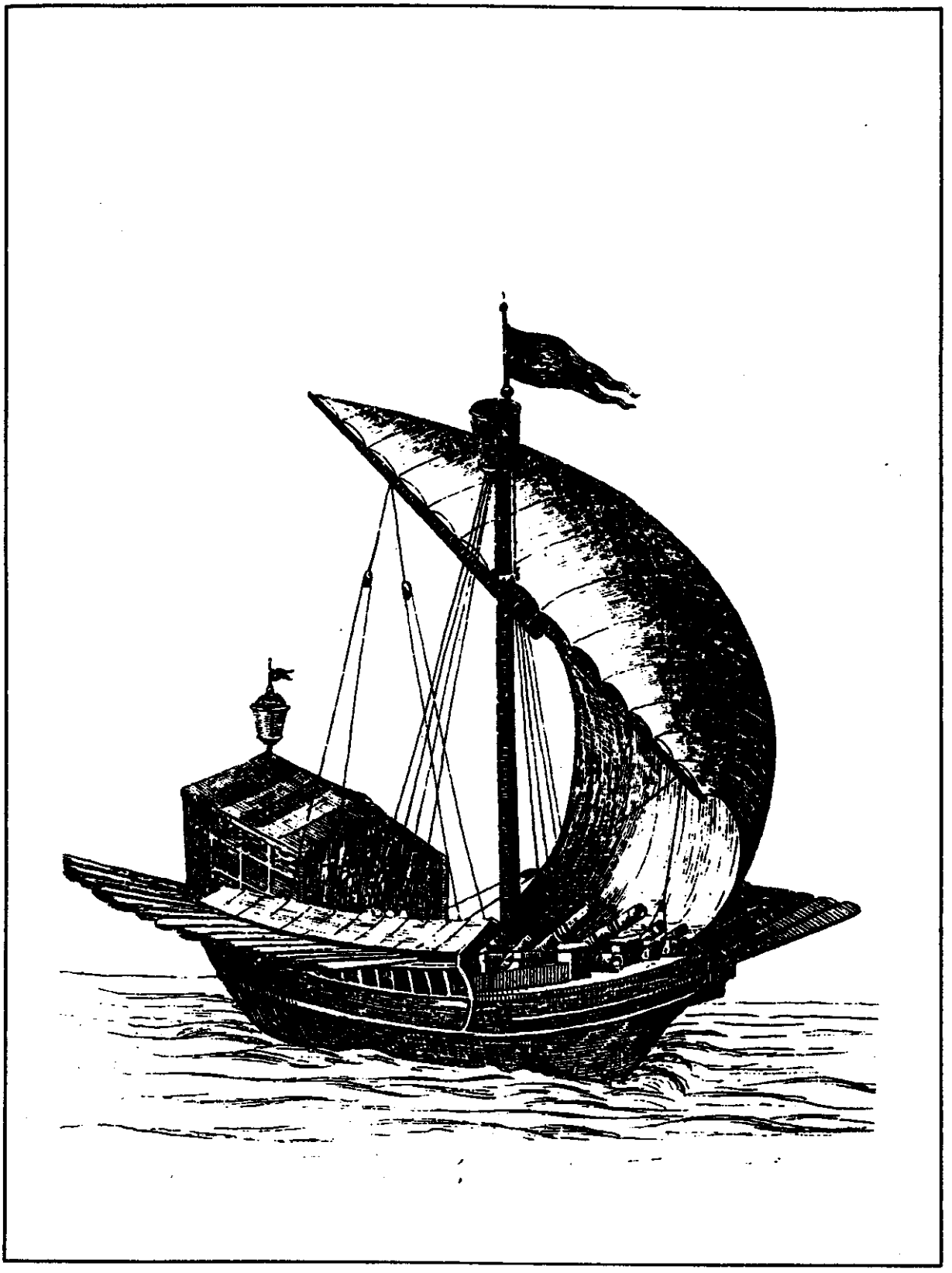


**Figure 98** Galley under sail, from an engraving of the Museo Correr (Levi, 1892: Pl. XXII, fig. 1).

# CHAPTER IV

## INTERPRETATIONS AND CONCLUSIONS

This study resulted in the accumulation of new and valuable information concerning medieval Mediterranean vessels generally, and specifically, details pertaining to Venetian ships and boats. This chapter begins with a discussion of the lateen rig and ship construction. The chapter continues with a review of certain attributes of Venetian craft based on the catalog, including a typology of the representational evidence for Venetian ships and boats; Venetian ship and boat stern variations; steering devices and their mounts; and, anchors. The chapter concludes with ideas for further research.

### The Lateen Rig

Almost all the ships located in this sample, as is usual for medieval Mediterranean vessels, had lateen rigs (Figure 99). Lateeners are characterized by their huge triangular sails hung on long yards obliquely set on forward-raking masts. Yardarms could be slanted and adjusted to the wind direction, and each yardarm itself provided the leading edge of the sail (Kreutz, 1976: 82). On multi-masted vessels, the foremast, set far forward in the bow, was almost always the tallest mast, and also the mast with the strongest rake. The yards, longer than the overall length of the ship, were made up of two (or more) sections securely fished together. The upper section of the yard was called the *pennae* in medieval Italian documents, while the lower section was referred to as the *carra* or *cares*; together they were known as *peciae antennarum*. The yard was raised on its mast with the halyard, the *amantus* (Figure 99 A). The halyard passed through lateral sheaves in the *calcet* (Figure 99 Cal), a special block scarfed to the masthead, and ran through a block (*tagia*; Figure 99 T) and tackle (*jonchus*; Figure 99 J) to facilitate hoisting and tightening. It was rove off aft; thus it doubled as a backstay (*suste*). No forestays were used, since they would have interfered during tacking and jibing. Numerous shrouds (*candelae*; Figure 99 C), sometimes up to 13 or 14 per side on a mast (Pryor, 1984, no. 4: 365), attached below the *calcet*, and were made taut to windward with deadeyes so they could be quickly cast off. The yard was secured to its mast with the parrel and its tackle (*troca*; Figure 99 Tr and *anchus*; Figure 99 An), which made the yard's position relative to the mast adjustable, as well as reduced friction, thus preventing wear.

The running rigging required on medieval lateeners included a

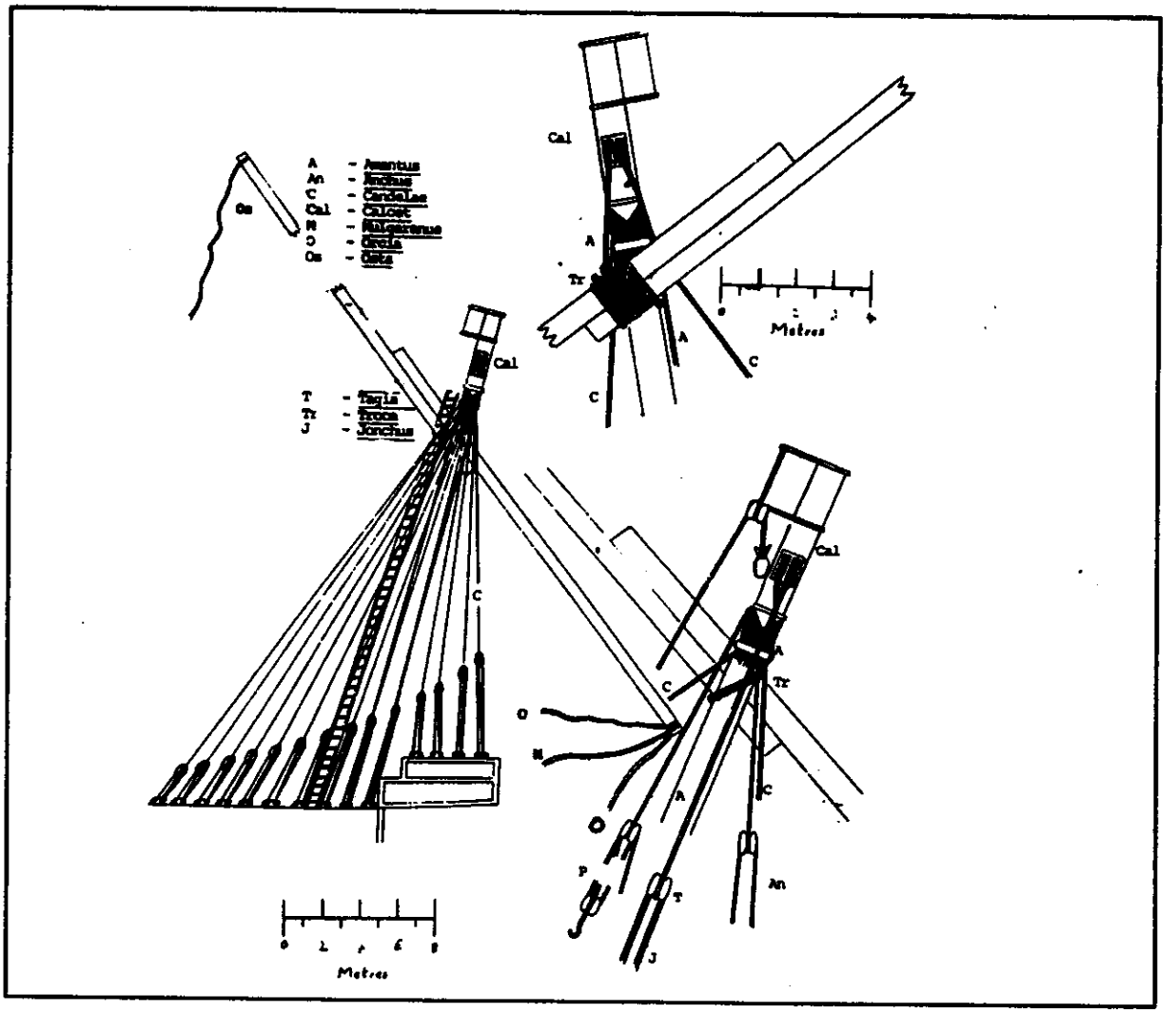



**Figure 99** Medieval terms used for lateen-rigged vessels, based on the foremast rigging of an archetypal three-decked lateen-rigged round ship (Pryor, 1984, no. 3: fig. 13).

minimum of three lines, but commonly they had up to seven lines. The peak (the head of the sail) was trimmed by one or two vangs (*osta*; Figure 99 Os), which usually attached to the *pennae* a bit in from its uppermost end. One vang to windward was essential; some depictions show another vang to leeward (e.g., Figure 74). The clew (the lower corner of the sail) was controlled by one or two sheet lines (*pozia* or *pozal*; Hocker, 1987: 367, and Bonino, 1978 B: fig. 1[40]); larger ships needed two, one to port and one to starboard. Having two sheet lines made

[40] According to Bonino, the terminology is: *pozal* for sheet, *pòza*, the starboard bowline, *orza davanti*, the port bowline, *frascón*, the vang.

changing tack easier; since the opposite tack sheet was already set up, it was not necessary to lead the sheet around to the opposite side. The side-to side movement of the heel or tack (the forward corner of the sail) was maneuvered by two tack, or bowlines (*orcia*; Figure 99 O; Hocker, 1987: 367), attached to the lower end of the *cares*, and running to both windward and leeward sides. Sometimes medieval lateeners had a third, heavy line with a pulley block attached to the lower end of the *cares*. It was called the *mulgaranus* or *marganàli* (Figure 99 M), and controlled the up-and-down movement of the yard, either while sailing, to peak the yard to maximum efficiency, or during tacking.

Several attributes of a medieval lateener minimized the awkwardness of its tacking maneuver: the masts all raked slightly forward, crow's-nests were usually attached aft at the head of the mast, shrouds were set up on lanyards and deadeyes. Tacking a lateener was quite cumbersome, in fact, and required a large crew. Landström has described and illustrated (Figure 100) the maneuver excellently:

> The lateen sail was hoisted outside the shrouds, and the leeward shrouds were slackened so that the yard could be trussed to the mast. If it was desired to tack when going to windward (Figure 100 A) it was necessary to fall off the wind. The brace[41] and sheet were made loose (Figure 100 B), the parrel was slackened somewhat so that the yard was freed slightly from the mast, and then one of the crew hauled on the yard until it was vertical. The sheet was then transferred to the other side (when there was only one sheet) and the sail was allowed to blow forward (Figure 100 C) while the shrouds now to windward were made taut and those to leeward were slackened. When the vessel began to turn into the wind the sail was sheeted home on the leeward side, the yard retrussed to the mast and trimmed with the tacks and braces for the new tack (Figure 100 D). On ships as large as the crusader vessels it must be assumed that the yard was forced over with the aid of tack tackles (Landström, 1968: 83).

The main advantage of the lateener was that it could sail almost regardless of the wind direction. Another advantage was that, in a sudden storm, the sail could be deactivated quickly, simply by loosening the main sheet (Kreutz, 1976: 98). Its major disadvantage was that the medieval lateen sail could not really be brailed. If the wind strength changed drastically, the yards had to be lowered and sails changed completely (Pryor, 1984, no. 4: 363). A large crew was therefore necessary to sail the lateener. A square-rigged ship could be brailed, and thus required a smaller crew. It could not sail as close to the

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[41] The term brace is usually used to refer to rigging of square rigged ships. On lateeners, the lines controlling the peak of the sail are more commonly called vangs or bowlines.

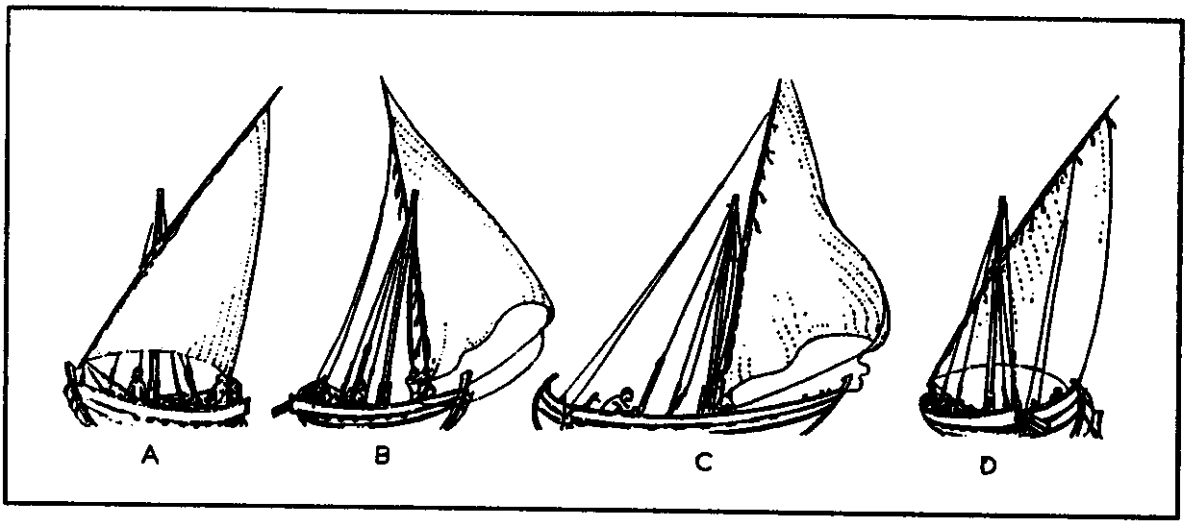



**Figure 100** A lateener tacking to windward: A) fall off wind; B) free yard, haul it to vertical C) bring sail and sheet to other side; D) turn into wind and trim for new tack (Landström, 1961: figs. 215-18).

wind, however, so even after the square sail became common again on large round ships, the lateen rig continued in use on galleys and small craft (Lane, 1934: 123), and many ships were fitted with lateen sails on some of their auxiliary masts. With all square, lateen and mixed-rigs, ships waited for the right winds and steered with sail settings as much as by their steering apparatus (Pryor, 1984, no. 4: 377).

### Ship Construction

The artistic representations in our catalog which depict ships or boats under construction (Figure 45, Figure 46, and Figure 78) all date to the first half of the 14th century, and illustrate the frame-first or skeleton-first system of construction in common use by that time in the Mediterranean. Archaeological discoveries and technical treatises on ship construction supplement the minimal information evident from these few representations and prove that the transition to the new approach to shipbuilding in fact occurred during the early medieval period (Kreutz, 1976: 104). Some technical treatises include illustrations relevant to construction or are sufficiently precise enough to give good indications about several types and their construction. Therefore, illustrations from *Zibaldone da Canale*, *Arte de far vasselli*, and the book by Zorzi of Modon (Figure 57, Figure 58, Figure 59, Figure 60, and Figure 61) have been included in the catalog.

These and other treatises on ship construction are excellent sources of information which no doubt reflect at least some aspects of earlier methods of construction, and have been the object of many worthy

studies to which the interested reader may refer.[42] Of these, Chiggiato's paper on Venetian naval architecture, published in 1987 with a transcription of the entire *Ragioni antique* manuscript, is discussed (p. 230), since it is a relatively early document, and Chiggiato's study of it is thorough. First, an overview of the archaeological finds to date will be given.

Remains of three boats found in the Veneto-Romagna regions, at Cervia, Pomposa, and Pontelagoscuro, exhibit the shell-first method of boat construction. In building with this system, flush-laid, edge-

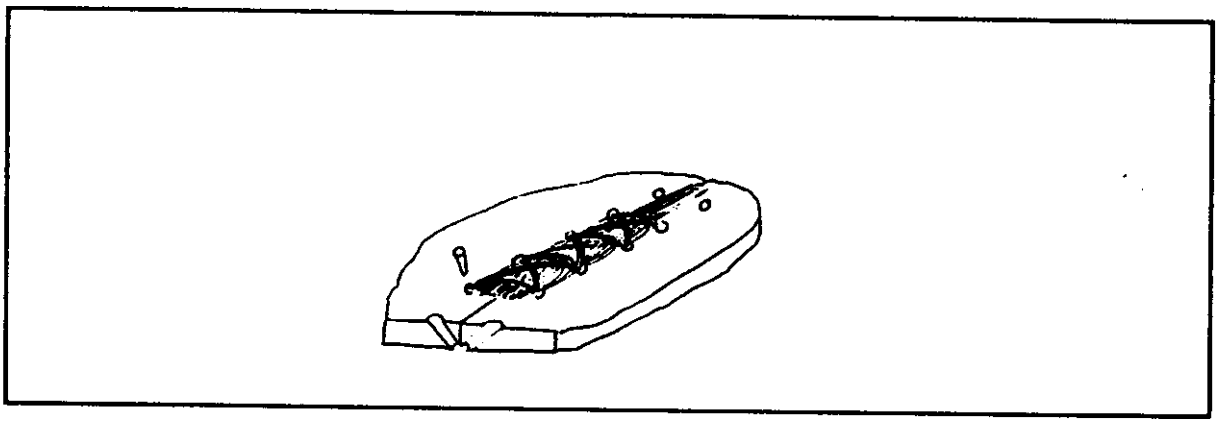


**Figure 101** Remains of the 4th-6th century boat found at Cervia (Bonino, 1978 A: fig. 9 C; courtesy of the author).

joined, planking forms the basic hull shape, and reinforcing framing is inserted only after the hull is shaped. This is a very ancient and long-standing technique, with examples dating at least as far back as Old Kingdom Egypt, and continuing in use, apparently, throughout the medieval period (Bonino, 1978 B: 22).

Hull remains found at Cervia (4th-6th century), now at the Museo Nazionale of Ravenna, are apparently from a boat suited for either sea or river navigation (Figure 101). The hull is entirely built of flush-laid oak planking, sewn together through holes prepared by a drill or an auger (Bonino, 1978 A: 40-41).

A boat of identical construction but much later in date (11th

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[42] Jal (1840), on medieval warships and merchant ships; Anderson (1925 and 1945), on the 15th century *Fabrica di Galere*; Laughton (1956), on the Roccafortis of 1268; Lane (1934) and Bonino (1978) discuss many of the treatises; Pryor (1984), on merchant ships (*navis*) based on the crusader contracts of the 13th and 14th centuries, and various technical treatises, and Chiggiato, 1987, who provides an explanation of the system of ship building described in *Ragioni antique spettanti all'arte del mare et fabriche de vasselli* (1480-1529).

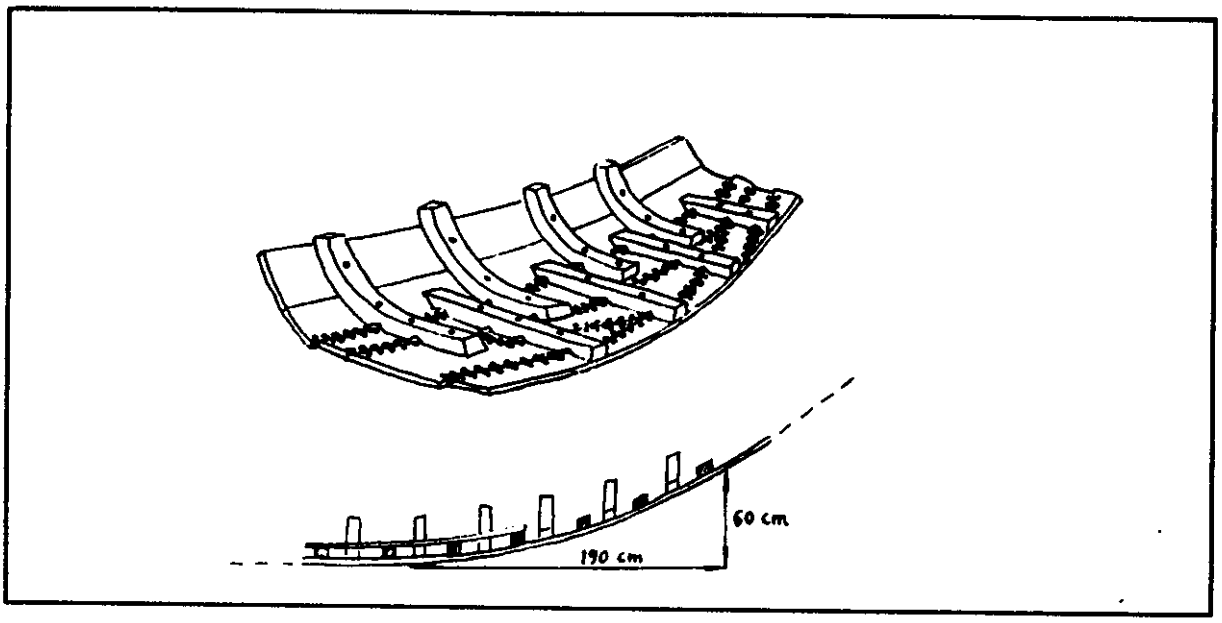



**Figure 102** Remains of the 11th-century boat discovered at Pomposa (Bonino, 1978 A: fig. 9 E; courtesy of the author).

century) was found at Borgo Caprile (Codigoro) or Pomposa, but it has yet to be excavated properly. As in the Cervia boat, oak strakes are likewise edge-joined and sewn (Figure 102). After the hull was shaped, framing was set inside approximately 40 cm. apart. The flat bottomed vessel has a gradually rising stem, and, according to Bonino, it may be of the *burchio* type. Bonino estimates the original size of the Pomposa boat to have been 10 m. long, with a beam of 2.5 m. (Bonino, 1978 A: 53-54).

Part of the side and bottom of a capsized boat was discovered at Pontelagoscuro (11th century?), and is now kept at Museo Nazionale of Ferrara (Figure 103). An area 7 m. x .9 m. of planking, edge-joined with long tenons, was found. The vessel is clearly very flat bottomed but has a hard chine. It is believed to be part of a *sandòn*, or floating water mill. The *sandòn* water mill boat developed in the early Middle Ages (Bonino, 1978 A: 54, 55, 212; fig. 11).

The frame-first method of construction was in use in Italy at least by the 11th century, and is the system portrayed in all the ship construction scenes of this catalog. With this technique, rather than using drawn plans, early Venetian shipbuilders probably worked from a series of templates called *sesti*, which determined the shape of the stem, sternpost, and the midship frame. The profile of the ship was set up first by laying keel and posts (see Figure 104 for one type of scarf used to join keel pieces). Next, sections at midship and near both stem

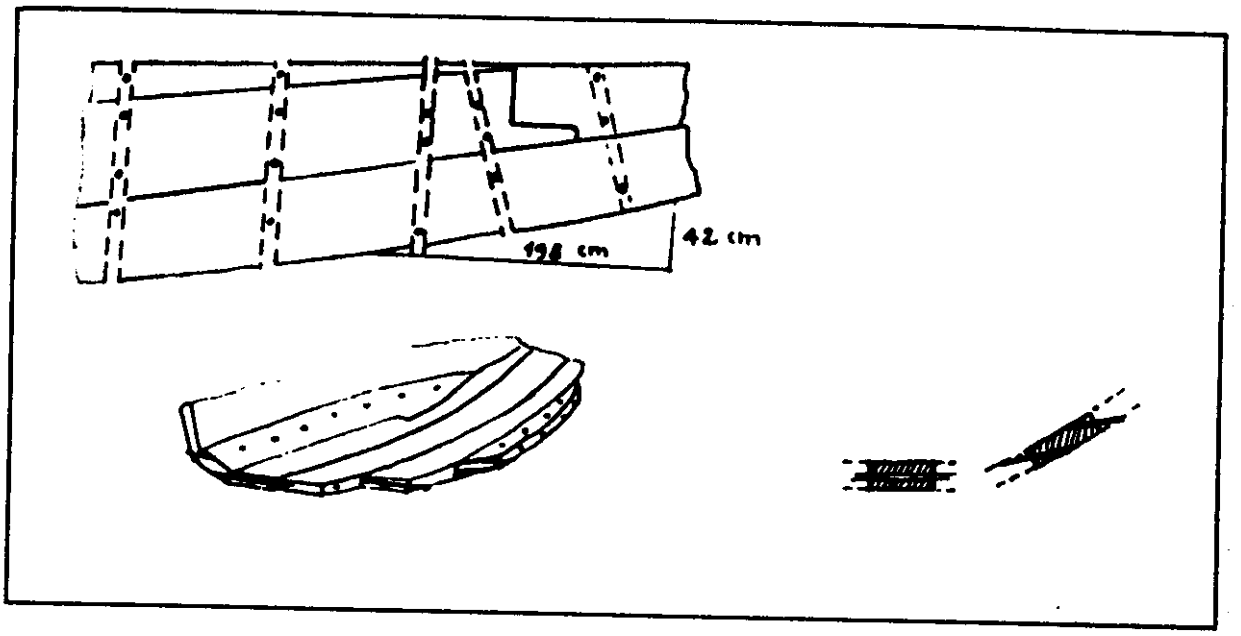



**Figure 103** Structural parts of the 11th-century (?) boat found at Pontelagoscuro (Bonino, 1978 A: fig. 11 A; courtesy of the author).

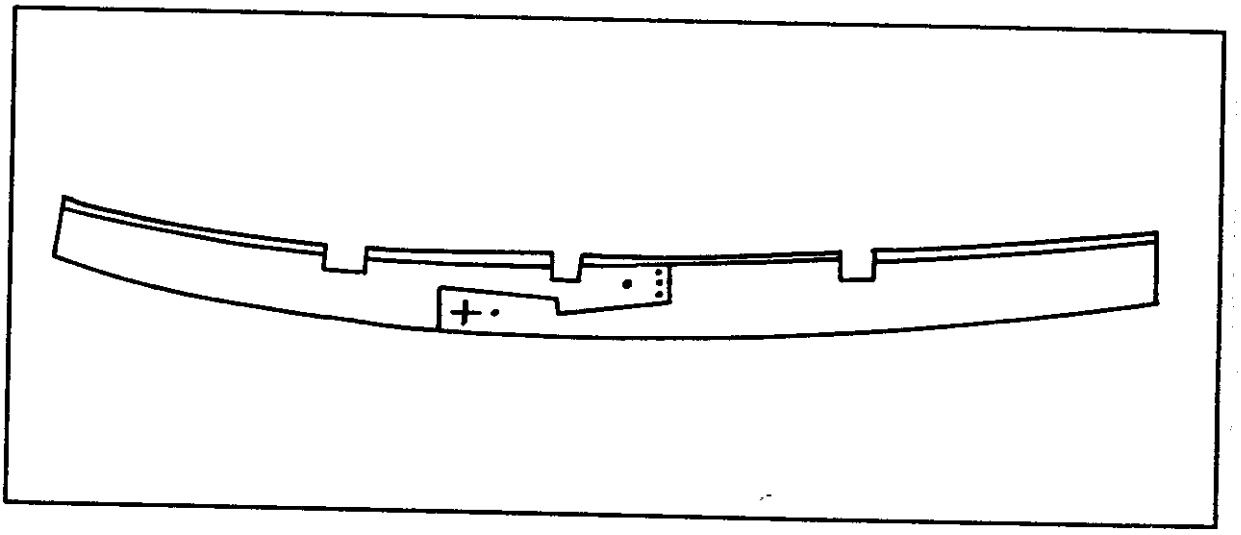


**Figure 104** Join between two pieces of the keel, from folio 43 of the 15th-century book by Zorzi of Modon.

and sternpost, the main points of reference, were set. Then flexible battens defining the wale lines were placed. Creating such a framework determined the shapes required for all the remaining frames, to which the strakes were laid flush and nailed. This proportional construction technique is the basis of that defined in later Venetian treatises on ship construction from the 15th through 17th centuries. These treatises on ship construction give a theoretical, geometrical way to determine

the shape of the frames (Chiggiato, 1987), but in practice, the shipwrights may have done so through experienced approximation. Once Venetians developed geometric methods to obtain the fair curves required in ship building, a reproducible hull was effected.

Contarina I, a medieval ship found and excavated in 1898 at Contarina, near what was in earlier times the mouth of the principal course of the Po River, has proved to be an invaluable source of information for further details of the frame-first construction system not visible or measurable in representations. The ship from Contarina dating from ca. 1300 is the best documented discovery from this region, and well exemplifies the frame-first construction technique (see Figures 105, 106, 107, 108, and 109 will follow).

At the time of its discovery, the wood of this Contarina ship was in excellent condition. Most of the iron fasteners, however, had completely degraded, so that the ship had to be excavated from within, allowing the external part of the hull to be supported by the surrounding sand. All timbers were carefully measured, but they were not preserved. Photographs were taken of the ship *in situ* (including Figure 105, and Figure 106). Bonito's reconstruction of the ship follows (Figure 107). Figure 108 is another photo of the ship taken in situ. Accurate plans were made and published (Relazione, 1901: 22-35; Figure 109). The Museo Storico Navale (Museum of Naval History) in Venice has a 1:10 scale model of the ship, crafted by Mr. Francesco Piccoli, carpenter of the Arsenal of Venice, plus retains the original excavation photographs and publication. The model is accurate to detail, except that the frames are shorter than they actually should be (Bonino, 1978 B: 15).

Figures 105, 106, 107, 108, and 109 will follow.



**Figure 105** View of the bow of the Contarina ship (ca. 1300), photographed *in situ*, showing the foremast mast step (Courtesy of Museo Storico Navale).

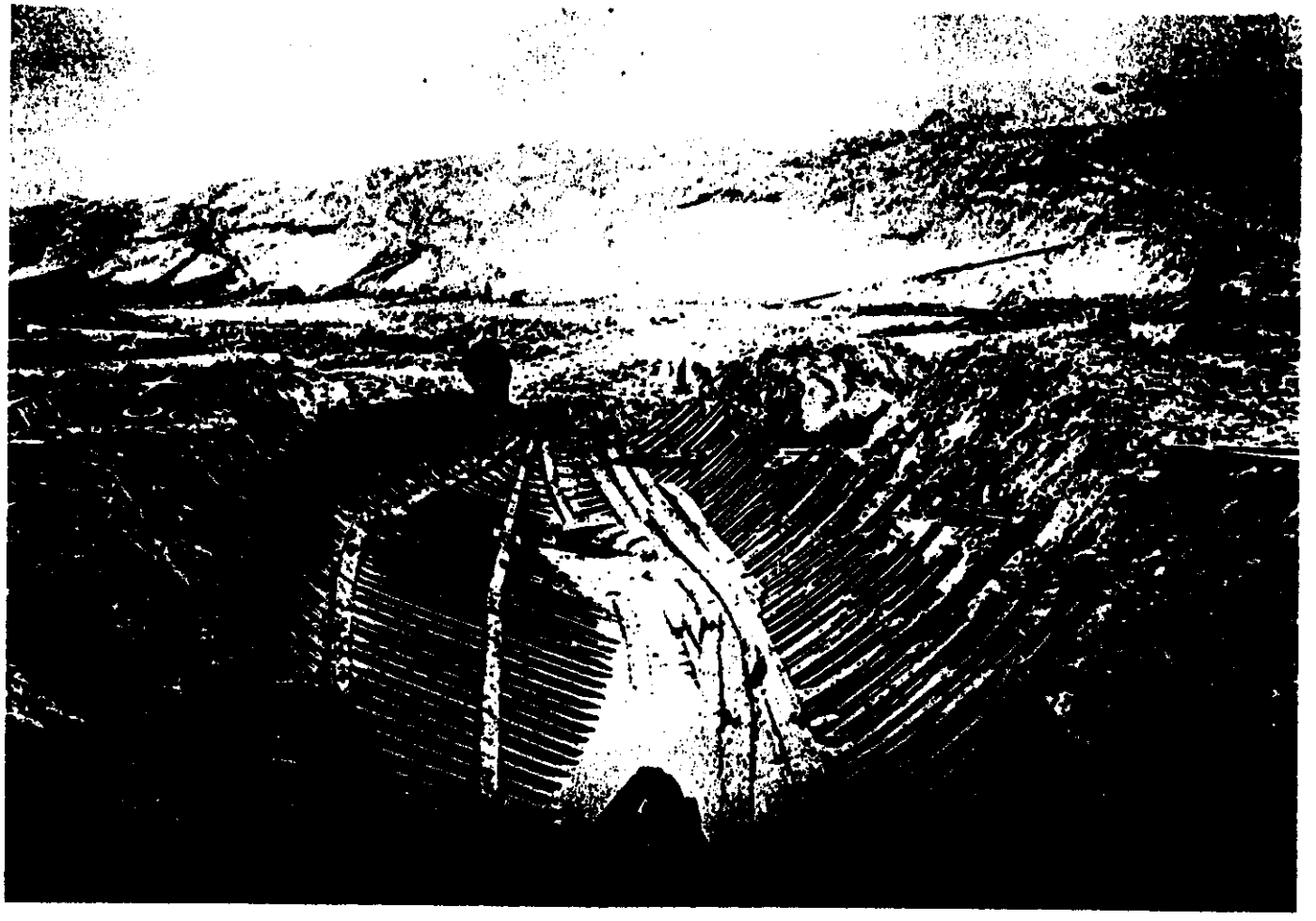


**Figure 106** The Contarina ship (ca. 1300), seen from the bow. Photographed *in situ* during the excavation in 1898 (Courtesy of Museo Storico Navale).

Contarina I was an average-sized two-masted lateen-rigged ship. Bonino estimates it was approximately 75 metric tons, 20.98 m. long, 5.2 m. in beam, and 2.46 m. high (1978 A: 62 and 1978 B: 13-15; Figure 107). The discovery of both mast steps verifies the mast positions seen in

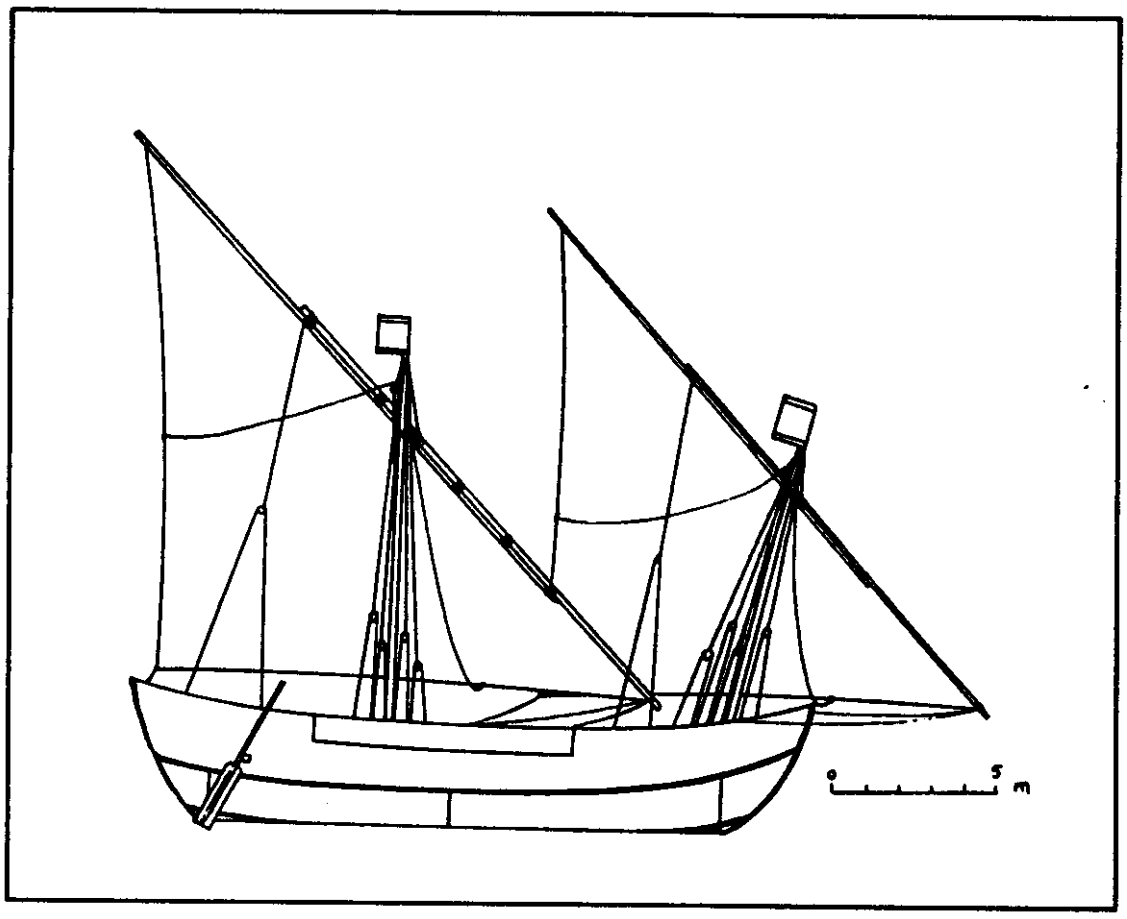



**Figure 107** Reconstruction of the Contarina ship (Bonino, 1978 A: fig. 14 A; courtesy of the author).

most medieval representations of two-masted lateen-rigged round ships: one mast was set slightly aft of midships, while the *arbor de prora* or foremast was set extremely far forward at the bow (Figure 106). The rather squat shape of the Contarina ship made her well suited for large cargoes (Relazione, 1901: Table III; Figure 109), while the dimensions of its mast steps indicate that it had tall, sturdy, solid masts. These characteristics lead one to believe that it was an ideal vessel for coastal trade. Its hull, in fact, is similar in proportions to the 7th-century seagoing ship found at Yassi Ada (Steffy, in Bass and van Doorninck, 1982: fig. 4.4). It was also similar in shape to the round ships represented in the Zibaldone manuscript (Figure 56 and Figure 57),

and Veneziano's painted polyptychs of round ships (Figure 73, Figure 74, Figure 78, Figure 79, Figure 80, and Figure 81).

Except for its larch inner wales, all timbers of the Contarina ship were oak (Bonino, 1978 A: 64). Remains revealed that her shipwrights utilized the natural curvature of timbers exclusively for the posts and framing (Relazione, 1901: 25). Apparently iron nails were used throughout; there was absolutely no evidence found for any mortise-and-tenon joints.

The straight keel consisted of two pieces, joined at their ends, with an overall length of 14.01 m., and width of 15 cm. Its height at midships was 7 cm., but this increased to 10 cm. at each end of the keel where it was attached to the posts. Only the lower pieces of the stem and sternpost were discovered, but these abutted the ends of the keel, and were fixed with two iron bolts. There was evidence for a simple scarf join in upper pieces of the posts. Where the posts extended from the keel, their profiles were straight for a bit over a meter, after which they became inward-curving. The posts were trapezoidal in shape, with their dimensions diminishing toward their upper ends. There were no rabbets on the keel nor the posts (Relazione, 1901: 24-25).

Evidence for any superstructures was entirely lacking (Relazione, 1901: 30) although the Contarina ship probably had at least a small quarter-deck, or may have been completely decked. Three facts indicate that the vessel was probably stripped and burned soon after sinking: evidence of burned timbers, the fact that no beams remained, and the discovery of so few associated artifacts (Relazione, 1901: 24).

Including the midship frame, fifty-eight frames were set perpendicularly to the keel, regularly spaced 28.2 cm. apart (Figure 109 A-C). Each floor timber or futtock (called *madiere* in Italian), was made of a single piece of wood 12 x 12 cm., although those which butted up against the mast steps were increased in their thickness to give additional support to the mast (Relazione, 1901: 29; see Figure 106, Figure 108, and Figure 109 E and G). Half-timbers (called *stamenale*) were attached to the floor timbers at a height of .75 m. In the 29 frames forward of the mast step for the mizzen mast, the floor timber and the top-timber (called *scalmo*) were attached aft of the half-timber. This is reversed in the 28 frames of the aft half of the ship, where the floor timber and the top-timber were attached forward, and the half-timber was aft. The midship frame was unique in that it had two half-timbers abutting one floor timber (Figure 109 B). As mentioned, both

the floor timbers and half-timbers measured 12 x 12 cm. in section, while the top-timber had a constant sided dimension of 12 cm., but changed its moulded dimension, becoming thinner toward its upper ends. The join of the half-timber to the floor timber and the top-timber to the half-timber was made with three cylindrical iron bolts or drifts 1.3 cm. in diameter. Each floor timber was joined to the keel with only one bolt, 1.5 cm. in diameter, passing through the keelson, where it was clinched. A small groove, about 2 cm. in diameter, was cut into each floor timber on the face which touched the external hull planking; this allowed the bilge water to flow freely under the frames to a central sump for pumping or bailing.

The framework of the bow and stern areas was quite similar: four frames at the bow and three at the stern were fitted to transom knees (called *gaisoni*), which bolted through the posts and joined to their frames at their heads. As all other frames, these measured 12 x 12 cm., and were set with the same frame spacing.

Strakes of the courses of external hull planking averaged 4 cm. thick, and were usually between 30 and 40 cm. wide, but toward the bow and stern (where they converged) they were narrower, roughly 13 cm. The plank scarfs were rather short and of irregular form; some were hooked, others just a simple scarf. The hull planking was joined to the frames with square iron nails, countersunk. According to the excavators, the garboard strakes were simply fitted to the keel, without any fastenings (Relazione, 1901: 28).

To strengthen the hull, a wale and a clamp or stringer were placed at the weak juncture of the half-timbers and the floor timbers. Another wale and clamp were set at the overlapping of the half- and top-timbers. These wales are fitted together and into the posts just like any other strake. The wales, made up with two pieces scarfed together, secured with two nails, were fixed firmly to the frames with four nails per frame. Bonino noticed that the first wale lay exactly three Venetian *piede* above the keel. He believes that this reflects the *trepie*, the most important standard shipbuilding measurement routinely specified in the later 15th to 17th century Venetian treatises, indicating the shape

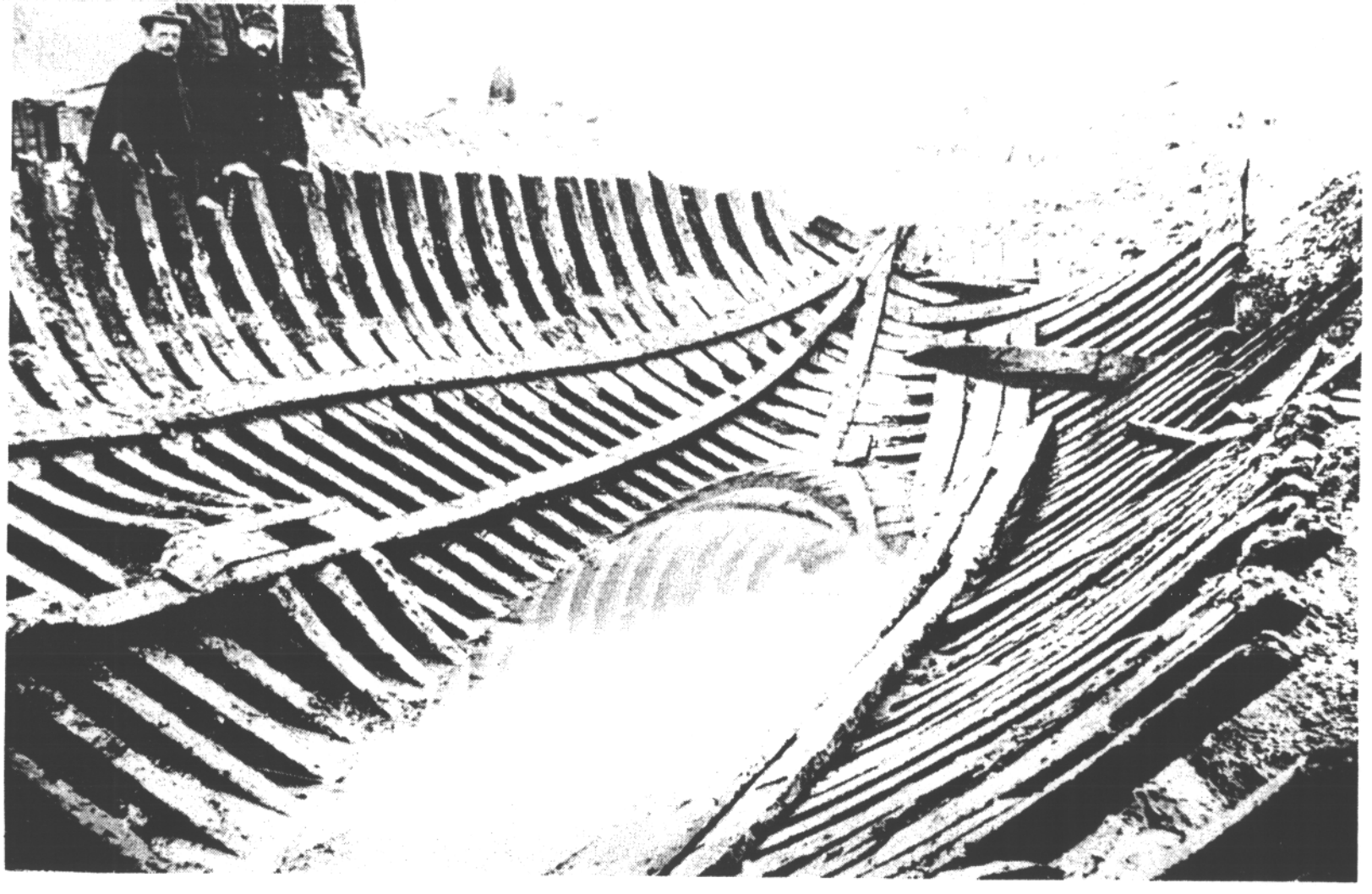


**Figure 108** View of the stern of the Contarina ship (ca. 1300), photographed *in situ*. Note the mizzen mast step (Courtesy of Museo Storico Navale).

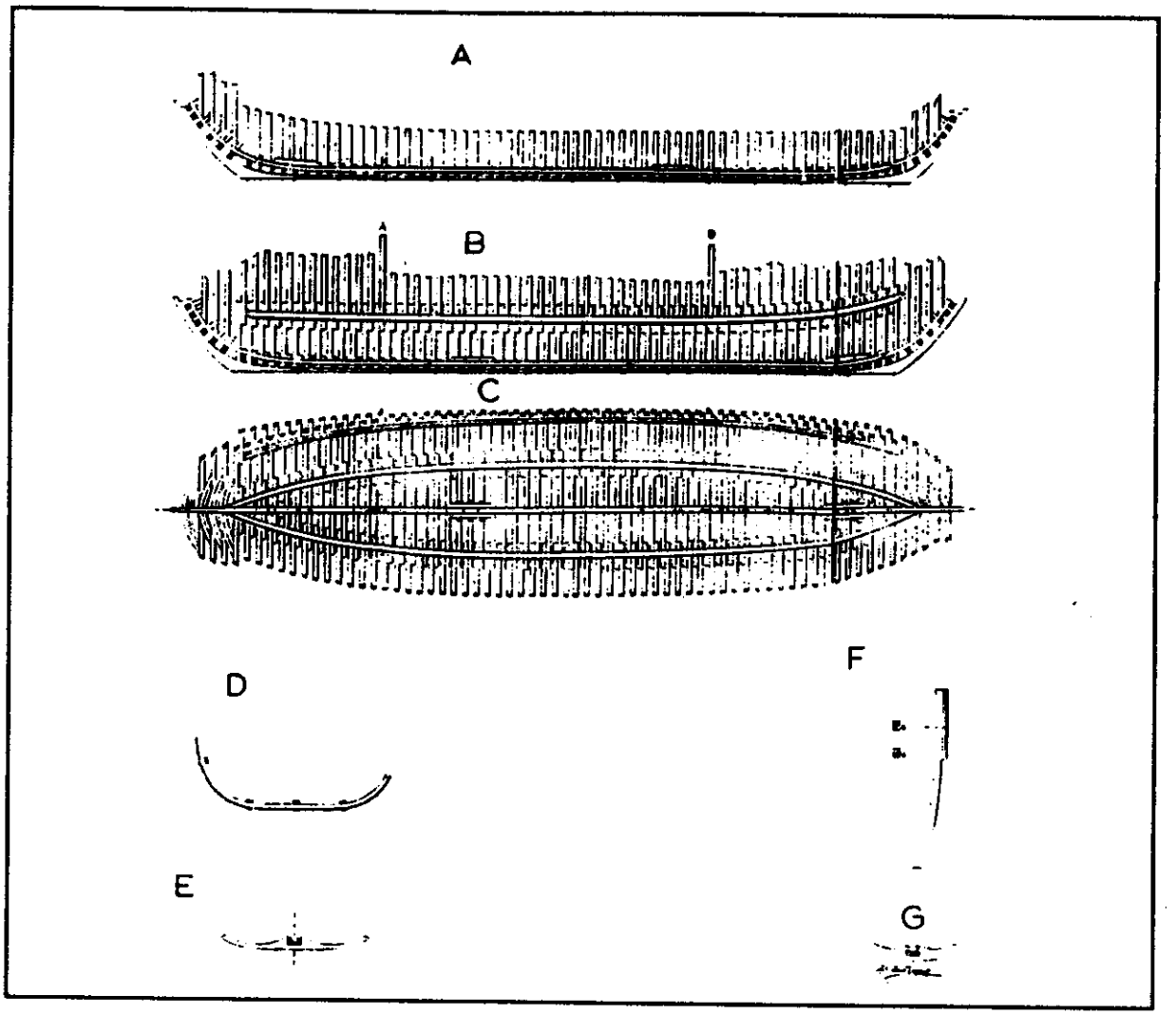



**Figure 109** Plan of Contarina I (ca. 1300) (Relazione, 1900: Table III; Courtesy of Museo Storico Navale).

A) Starboard profile; B) Port profile; C) Horizontal projection; D) Midships section; E) Frame of foremast mast step; F) Detail of side showing groove for movable side planking; G) Frame of the mizzen mast step.

of the frames at the point of maximum curvature at the *boca* (Bonino, 1978 A: 62-64, 213).[43] In any case, at least on the Contarina ship, the measure seems to have defined the location of the primary wale, significantly positioned along the line of the overlap between the floor timbers and the first futtocks, providing indispensable reinforcement along the length of the hull.

The excavators state that the keelson, or inner keel (Figure 105 and Figure 106), was an ineffectual structural element of the Contarina ship, since the keelson consisted of six pieces, joined with simple scarfs which were secured with only one peg at each join. However, these joins were always placed by a floor timber, to which the peg was secured, and along the central third of the ship, the keelson was sunk .8 cm. into the top of the floor timbers; fore and aft of this section, it sat directly upon the floor timbers (Relazione, 1901: 26-27). The keelson must have contributed at least some longitudinal rigidity to the hull.

The two robust mast partners were formed from two longitudinal pieces, 10 cm. wide, 20 cm. tall, and long enough to cover five frames, with an open section, the mast-step itself, 24 cm. long. The floor timbers abutting the steps curved upward to the top of the mast steps to provide additional strength.

Several features of the Contarina ship are unique pieces of evidence for medieval ships. These include unusual details of the side planking, and a through beam, that should be interpreted respectively as removable side planking, and a mounting place for the quarter rudder.

The fortuitous preservation of part of the port's bulwarks has explicated an irregular sheer strake conspicuous in Figure 15 and Figure 42. As shown in the starboard profile drawing of Figure 109 and the detail of futtocks A and B (Figure 109 F), on the

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[43] Pryor points out that in at least two documents, the *Fabrica di galere* and Timbotta's commonplace book, the *trepie* is specifically measured from the keel and not the floor. He implies that Bonino has misconstrued the evidence of the Contarina ship, measuring it from the floor (1984: 190). However, in Bonino's original publication on the Contarina ship, he states "in the first ship of Contarina ... the first wale lies exactly three Venetian *piede* (1.041 m) above the keel. The *trepie* was always indicated as a reference measure in all the Venetian treatises from the 15th to 17th centuries, which indicated the *boca*, the exact width of the midship section at three feet above the keel (1978: 62; my translation)."

In fact, in the earliest documents (including the *Fabrica*), the *trepie* is the moulded beam at a height of three Venetian feet, but by later treatises (including Timbotta's), it became a generic term for the second of three primary widths defining the shape of a particular section (Fred Hocker, personal communication).

starboard side of the Contarina ship, futtocks A and B have a unique feature: an augmented section stands about 1.5 meters taller than the other futtocks, through which a groove is created (Relazione, 1901: 29). A section of the exterior hull planking along the central portion of the hull could apparently slide into this groove, thus lowering the side of the hull. This has been interpreted as proof that the Contarina ship must have at times been rowed (Relazione, 1901: 34); I believe it would have facilitated boarding and loading.

At the stern, between the fourth and fifth frame on the port side, a large transverse beam was found projecting from the hull below the deck level. Although at the time of excavation this beam was interpreted to be intrusive, it probably was, in fact, actually in place. It was probably a through beam projecting through the hull below the deck to provide the mount for the port quarter rudder or steering oar (Pryor, 1984, no. 1: 181, and Bonino, 1978 B: 13-17).

A rudder pintle and degraded iron nails were found, completely encrusted with sand and shells. The pintle's encrustations have verified that the vessel was seagoing, since the encrustations contained coastal mollusks that had attached, while alive, to the iron rudder pintle (Relazione, 1901: 42).

The report makes no mention of anchors, but as the ship was apparently salvaged and burned, it is likely the anchors were recovered in antiquity.

Remains of Contarina ship

Dimensions:[44]

| | |
|---|---|
| Maximum length remaining | 19.62 m. |
| Estimated total length (Bonino) | (20.98 m.) |
| Maximum beam (excluding external planking) | 5.2 m. |
| *Boca* - Width excluding frames (Bonino) | (5.12 m.) |
| Width *in fondo* - flat part of hull bottom (Bonino) | (2.63 m.) |
| Width of floor (Bonino) | (2.63 m.) |
| Beam at *trepie* (Bonino) | (4.44 m.) |
| Depth from floor to gunwale (Pryor) | (2.9 m.) |
| Keel length | |
| (Pryor) | (14.01 m.) |
| (Bonino) | (16.5[45] m.) |
| Keel, moulded | |
| at midship | 7 cm. |
| at extremities | 10 cm. |
| Keel, sided | 15 cm. |
| Keelson length (Pryor) | (16.64 m.) |
| Keelson, moulded | |
| at midship | 10 cm. |
| at extremities | 8 cm. |
| Keelson, sided | |
| at midship | 14.5 cm. |
| at extremities | 9 cm. |

Posts, trapezoidal (exterior side x interior side x thickness), dimensions change continuously:

| | |
|---|---|
| Sternpost | |
| section where joins keel | 13.5 x 15 x 12 cm. |
| section at upper edge | 8 x 9 x 11.7 cm. |
| Stem | |
| section where joins keel | 13.5 x 15 x 10 cm. |
| section at upper edge | 82 x 10 x 16.8 cm. |
| Frames, moulded | 12 cm. |
| Frames, sided | 12 cm. |
| Exterior hull planking, average width | 4 cm. |
| Run of planking varies | 30-40 cm. |
| Run of planking, toward posts | 13 cm. |

[44] Most of these data are dimensions of the sections discovered (Relazione, 1900: 23-28). Calculations for original dimensions by Pryor (1984: 180) and Bonino (1978 B: 12) have been set in parentheses.

[45] Bonino includes the stem and stern posts.

A smaller vessel, but very similar to the Contarina ship in its construction, is a two-masted lateen-rigged boat discovered at Logonovo, near Ferrara, and dated to ca. 1400 (Figure 110). As in the Contarina ship, the keel, posts, and midships frame were set as the main points of reference. Because of its small size, no additional frames were set near bow and stern.

Like all of the vessels discovered in this region so far, the hull was almost entirely oak, with larch wood used only for the mast steps. The Logonovo boat had a very minimal keel, but a strong inner keel. After the hull planking was attached, the entire hull was covered with pitch. The boat has been dated to ca. 1400. Its flat bottom and very thin keel led Bonino to classify it as a river craft of the *marciliana* type (Bonino, 1978 A: 63-64, 72-73). Bonino has estimated the vessel must have measured approximately 10.05 m. long, with a beam of 2.55 m., and a height at midships of 1.14 m.

A unique find of a 15th-century galley warship was investigated in 1962 at Lazise, Lake Garda. The extremely light construction of galleys makes the find of a galley exceptional. The following measurements were recorded.

| | |
|---|---|
| Overall length: | 39.6 m. |
| Beam: | 4.9 m. |
| Planking thickness: | 2.9 cm. |
| Frames, moulded thickness: | 8.9 cm. |
| Frames, sided: | 7.0 cm. |
| Average frame spacing | 25.4 cm. |
| Keelson, sided: | 12.1 cm. |
| Keelson, moulded: | 9.8 cm. |

(Scandurra, 1972: 209-210; figures 3-5 and plates 10-18).

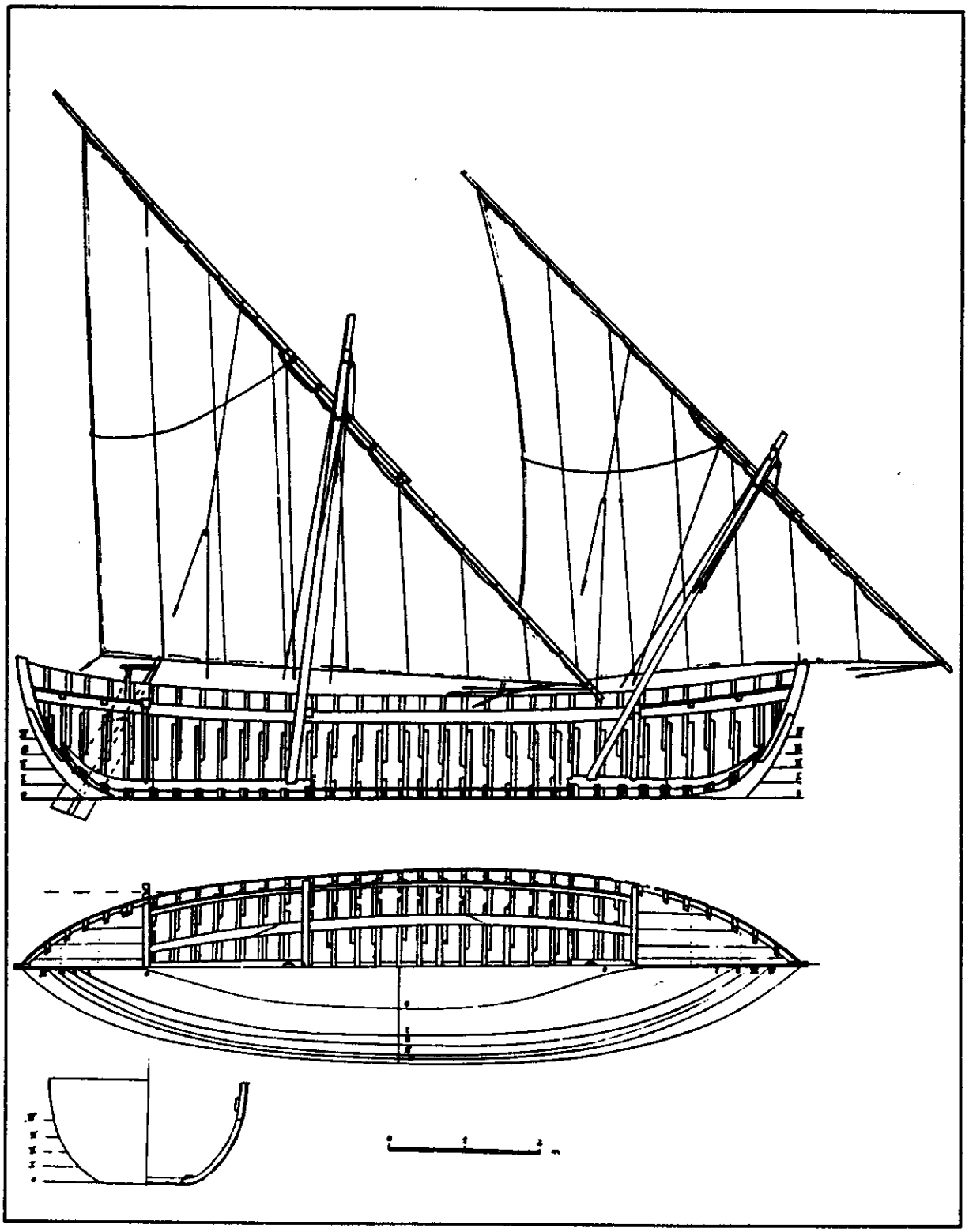


**Figure 110** Reconstruction of the Logonovo boat (ca. 1400), now in the Museo Nazionale di Ferrara (Bonino, 1978 A: fig. 16; courtesy of the author).

The size of Venetian vessels varied greatly depending on the intended use of the vessel. The following list is based on data from technical treatises (Lane, 1934: Table B and C):

| | Height at midship | Length | Beam |
|---|---|---|---|
| **Technical treatises** | m. | m. | m. |
| Great galley, for Cyprus voyage, 1318 | | 40.4 | 5.5 |
| Great galley, ca. 1445, described by Timbotta | | 48.3? | 5.9 |
| Light galley, "galley of the guard," ca. 1410 | | 38.8 | 4.4 |
| Light galley, ca. 1450, described by Timbotta | | 40.9 | 4.87 |
| Lateen round ship, Fabrica di galere, ca. 1410 | 3.3 | 27.8 | 8.4 |
| Round ship, ca. 1450, described by Timbotta | | 29.6+*slanci* | 11.8 |

The following data is from known shipwrecks, and three reconstructions of pictorial examples (With the exception of Figure 64 and the Lazise galley, from Bonino, 1978 A: Appendix II, 212-213):

| | Height at midship | Length | Beam |
|---|---|---|---|
| **Shipwrecks** | m. | m. | m. |
| Cervia (4th cent.) | 1.5 | 12.5 | 3.5 |
| Pomposa boat (11th cent.) | | 10 | 2.5 |
| *Sandòn* of Pontelagoscuro | 2? | 15? | 5? |
| Contarina (1300) | 2.46 | 20.98 | 5.2 |
| Logonovo (1400) | 1.14 | 10.05 | 2.55 |
| Lazise (early 15th cent.) | 39.6 | | |
| **Reconstructions** | | | |
| Longidieno (relief, 1st cent. B.C.) | 1.2 | 9.7 | 2.4 |
| Crusader mosaic (1202) Figure 18 | 5.3 | 33.2 | 9.6 |
| Menabuoi fresco (14th cent.) Figure 64 | 1.6 | 10 | 3 |

The earliest documents mentioning Venetian ship construction are from the 14th century, but the frame-first technique these manuscripts describe certainly dates from much earlier. The technique, possibly Greco-Byzantine in origin,[46] was used throughout the Mediterranean. Alvise Chiggiato's study and reconstruction of the flat bottomed galleys (1987: LVII-LXXIX and Table B and C) described in the manuscript *Ragioni antique spettanti all'arte del mare et fabriche de vasselli* (1480-1529)

[46] By the 12th century, however, Venetian shipwrights were already considered superior ship builders, as witnessed by the fact that the Byzantine emperor, Isaac Angelus, had Venice build ships for the empire in 1187, and had previously relied on the Venetian navy (Norwich, 1977: 121).

incorporates evidence from contemporary manuscripts, and contributes to a better understanding of the ship construction methods employed in Venetian shipyards.

Because warships needed to be produced in great numbers and more rapidly, and consistency of their proportions was more important, there is naturally more written documentation for galleys than for merchant ships. Interpretation of the data given in these technical manuscripts is challenging, since essential details were doubtless left out, whether for secrecy or because taken for granted as being obvious.

The manuscripts succinctly define the ship's hull by the *sceda*, a brief list giving only seven statements and no more than eleven distances between specific points in the hull.[47] The hull was conceptualized in three parts: the central body of the hull, where the bottom of the hull is flat, and the two ends, finishing with the bow and stern. The *sceda*, combined with the use of a *mezo redondo* (Chiggiato, 1987: fig. 1), a special protractor tool used to obtain curves and distances based on projections of the Y axis (the sinusoid)[48], set up a framework of geometrical functions which could produce any desired variations in size or shape. Aided in the shipyard by two pre-marked curved moulds and two or three *stazze*, or pre-marked sticks,[49] this made an accurate duplication in full scale of a ship easy to reproduce in the shipyards, as exact as the modern shipwright's drawn plans.

Almost all of the initial measurements derived from the *mezo redondo* are based on the *boca*, the width of the midships beam. The *mezo redondo* was used to derive the ship's lines, the curvature of its frames, as well as the deck, and even was used in the cutting of its sails. For example, the shape of the flat part of the hull bottom (*partixon de fondi*) was derived by using the Y projections of the first quadrant (Chiggiato, 1987: fig. 2).

Chiggiato found that only two curves necessary to define the hull

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[47] Chiggiato believes the *sceda* evolved from an early methodology of verbally transmitted messages, simplified to seven essential statements and eleven measurements (Chiggiato, personal communication, letter dated April 14, 1989).

[48] This geometry tool was called *mezo redondo* by Zorzi da Modon, *mezzo tondo* by the author of *Fabrica di galere* and *mezzaluna* by Crescenzio.

[49] Such tools are still in use in shipyards of today.

were not derived geometrically,[50] and only a few corrective measures were necessary to obviate undesirable shapes in the hull, such as the flattened sides of the hull that would result by using the sinusoid alone to obtain the tapering of the hull (Chiggiato, 1987: fig. 3).

Chiggiato does not account for the way in which the length of the ship was calculated. *La architectura navale* by Stefano di Zuanne (1686), however, has an answer to this essential determining factor. The length was determined from the *interscalum*, the distance between oars. Then, according to *La visione di Baldassarre Drachio* (1593), the two posts were set, and the midships beam was fixed at 1/8 of the length (Concina, personal communication).

**Types of Venetian Ships and Boats Mentioned in Textual Evidence**

In order to develop the most accurate typology of medieval Venetian watercraft possible, all forms of evidence, that gleaned from textual sources, pictorial evidence, and marine archaeology, must be integrated to compensate for the fact that each source of evidence has a preponderance of certain types over others. For example, literary sources supply evidence for warships that is scant in the artistic and archaeological records, while representational evidence predominantly portray the merchant ship types not emphasized in the textual evidence. If one based a typology solely on the textual evidence, the resulting typology would be vague at best, especially for the period under study, since written records from the 8th to the 13th centuries mention few ship or boat names besides the ambiguous term *nave*. Until the 13th century, the word *nave* was used so generically that it has almost no meaning beyond "vessel capable of navigation." Beginning in the 13th century, however, a greater distinction of types was made in the written record.[51] Even so, a serious problem to be faced is that "writers virtually never give the characteristics of the ship types they mention," and, since one term can refer to more than one vessel type, "ship type designations can be ... misleading (Kreutz, 1976: 94)."

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[50] The *catinara*, the height of the frames, was obtained by hanging an oiled halyard taut between the posts, and lowering it until the desired sheer was obtained, and a series of quarter ellipses (probably obtained by moulds in the yards) was necessary to obtain vertical profiles (Chiggiato, personal communication, letter dated April 14, 1989).

[51] Thus we find, for example, Zeno's code of 1255 was divided into two sections, clarifying regulations for two distinct merchant ship types, the *nave* and the *tarrete*. From the requirements, it is evident that the *tarrete* was a smaller type round ship than the *nave*.

Another limitation of the textual evidence is that it primarily concerns military exploits, and gives little emphasis to mercantile ships and smaller lagoonal and fishing craft. Archaeology is likewise limited: to date only four of the numerous vessel types known to have existed have been brought to light.

This section presents a brief inventory of ship and boat names from medieval Venetian textual sources. The next section presents the typology developed from this pictorial catalog, which is supplemented by the previous discussion of construction based on the six archaeological examples discovered to date. The textual evidence is presented as a cursory list of the vessel names, terms that occur in written documentary sources, including nautical codices, shipping contracts, government records, chronicles, etc. The names are frequently Venetian or north Italian dialectical versions of terms common in other Latin sources. The terms are grouped by century, placing each vessel name in the century of its earliest documented occurrence. This arrangement does not mean to preclude the indisputable certainty of cases where a vessel type continued to be used in the subsequent century or centuries, but has been done in the interest of brevity. The compilation is based on the studies of Casoni (1847) and Bonino (1978 A),[52] and, along with examples from the archaeological record, well supplements the typology developed for the representational material in the subsequent section.

The most basic distinction between ship types classifies them as either long ships or round ships. Long ships were elongated, low sided, oared vessels which usually had only one mast, if any. Their large crew and maneuverability made them well suited for warships, for which they were heavily armed. Round ships were beamy, high sided, and relied completely on sail power. They often had two or more masts, and traveled relatively unarmed. Their great carrying capacity and more economical crew sizes made them best suited for the merchant marine. Because round ships were generally less regulated, they are therefore less well recorded (Lane, 1963: 194).

The earliest Venetian trade was conducted on the rivers of northern Italy, key rivers which led inland to the trans-alpine trade routes. It is therefore not surprising that in the Venetian documents

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[52] Study of the primary sources would require additional training and research time in Venice. Etymologies will not be explored since expected results of such a study would be indefinite and of limited value to this thesis. The secondary sources utilized to create this typology include Bonino, 1978, Archaeologia e tradizione navale tra la Romagna e il Po, and Casoni, 1847, Venezia e le sue lagune, Venice: Nell'I.R. Privil. Stabilimento Antonelli.

of the 5th and 6th centuries, most of the vessels mentioned, the *rascòna* (Figure 111), *campolo*, and *cursorie*, were trading vessels of modest size well suited for river navigation.[53] Two other types mentioned, the *acazie*, a vessel used as either a war or cargo ship, and the *liberniche*, an oared warship also used occasionally for commerce, were doubtless employed on rivers as well. The *campolo* and the *scrilla* ran the local commerce within the lagoon and to nearby river destinations.

Written records of the 7th century mention several commercial ships, including the *marciliane*, the *pandora*, the *varchette*, and the *tarete (tarede, taride)*. The *tarete* was a small round ship well adapted for coastal trade (Unger, 1980: 125), although it was also used as a military transport, and, as did *navi lunghe* (long ships), often had two masts for sail power to supplement rowing.

The 8th century Venetian texts show a slightly greater diversity of types. The *sandòn* was a flat bottomed river craft used as a floating water mill on the Po and Adige Rivers (Bonino, 1978 A: fig. 11 and 1978 B: 27). Another river craft was the *scafa*, a small cargo boat which was towed behind a larger vessel. The *cymba (cumbus)* and the *carabus*[54] were larger round ships suitable for coastal and riverine trade. The generic *navis* term included the *banzonus*, *buzus navis*, *buzo*, and *buzonavis*, all of which were used at this time primarily as coastal and riverine merchant ships. The *bucintoro* type mentioned in texts of the 8th to 14th centuries refers to a strong war galley, and not to the ceremonial barge of Renaissance Venice.

Texts of the 9th century specify primarily warships and transports, including the *chelandia, usiache (usie), ippagoghi (ippegi, hippagmi), palandarie, dromone (dromone proprio, dromone nave), navi castellate, nave turrita (tarida)* (see Bonino, 1978 A: figure 8 B), *panfile, galee, navi belliche, nave oneraria, pistro, nave grossa, trierio*. Of these, the *dromone* (dromon) was a bireme long ship, rowed from two levels, rowing supplemented with one to three lateen sails; the *panfile* was a smaller version; another small dromon-like vessel used to guard the lagoons of Venice from the Saracens, was specifically referred to as *chelandia* (Lane, 1973 B: 27 and Bonino, 1978 A: fig. 20 A); the *nave oneraria* was a transport; the *ippagoghi* and the *usiache* were high-sided horse transports; the *usiache* was a modified *chelandia*.

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[53] In fact, cargoes were frequently transshipped as they went upriver: they were loaded, as necessary, onto vessel types better suited to local navigation conditions.

[54] The term *carabus*, from the Greek, *karavion*, also refers to an early primitive skin boat (Bonino, 1978: 18; fig. 1).

The few ship types recorded in documents of the 10th century are likewise primarily warships and transports; this reflects the growing concern among the Venetians for military protection. The types mentioned include the *usserii (uscieri, uschere)* and the *arsilii*, also horse transports, and the *cumbarie (gumbare, gambarie)* was like the *bucintoro* and *chelandia*, a type of long galley. The term *chelandia*, besides indicating a small dromon, now sometimes referred to a flat bottomed military river boat.

Although by the year 1000, Venice was certainly a seagoing nation (Lane, 1973 B: 1), 11th-century texts still mention more lagoonal and

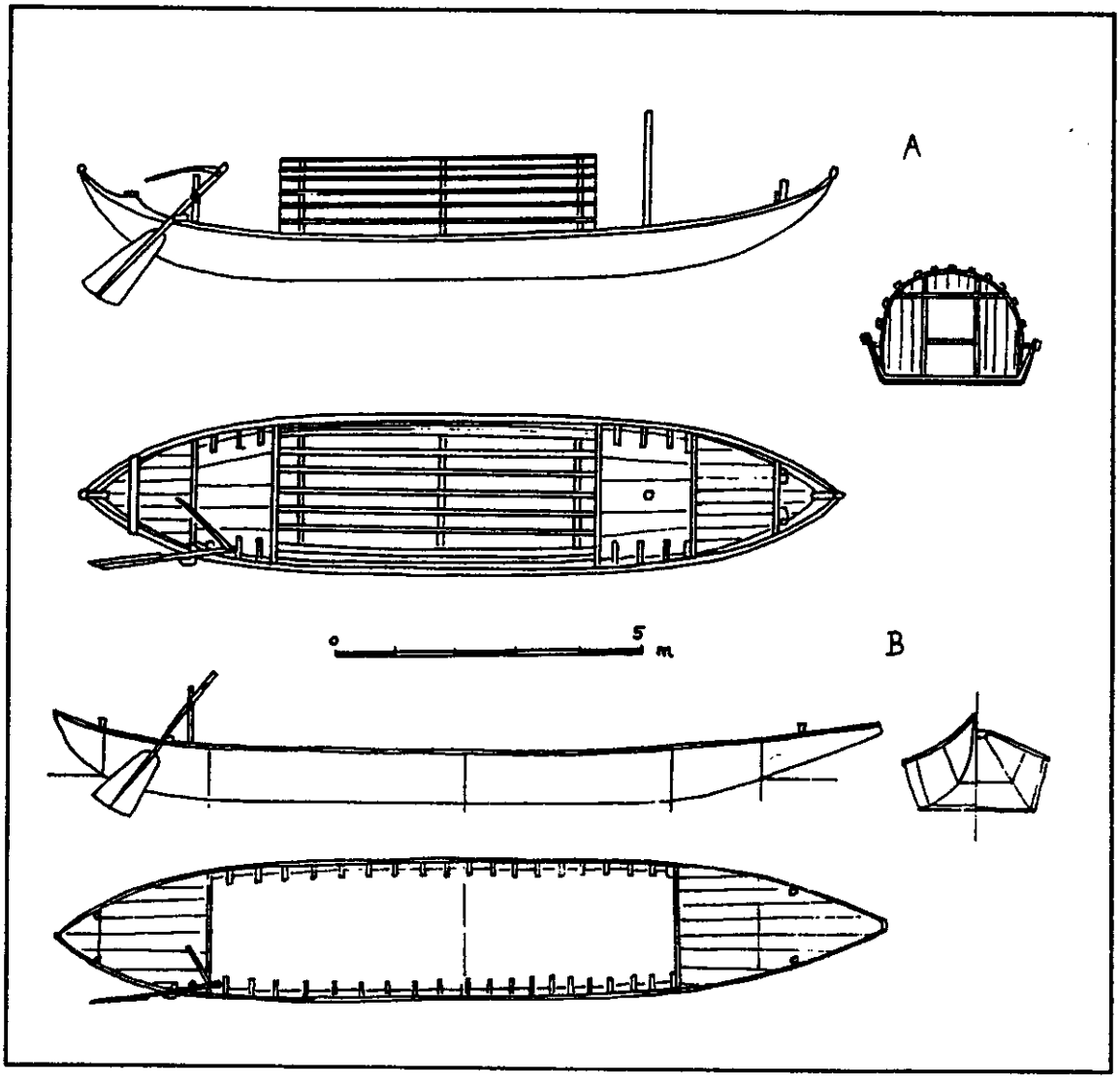



**Figure 111** The flat-bottomed *rascòna* type, derived from the ancient *burchio* type. A) 18th century example; B) 20th century example (Bonino, 1978 A: fig. 26).

river craft than seagoing ships: the *burchio* (Bonino, 1978 A: figs. 20 B-D, 21 and 25), *burchièlla*, and *battello* types (Bonino, 1978 A: figs. 24 A and 24 B) were used in river and lagoonal trade, while the *battana* (Bonino, 1978 A: figs. 24 C and 32) and the *saica* were lagoonal vessels. Two types of bows characterized these river and lagoonal craft: the bow of the *burchio* river boat, like that of the *burchièlla* and the modern *rascòna* (Bonino, 1978 A: fig. 26; Figure 111), had a cutwater rising from a very flat bottom, while bows of double-ended vessels, including the *battello* and *battana*, were pointed (Bonino, 1978 A: 54). The *galea lunga*, a fast bireme warship, is also mentioned in documents of this century.

Written documents of the 12th century report only three new vessel types: the *seole* boat served for inland navigation, while the *paroneno* and the *brulotto* were seagoing war vessels. The *brulotti* were used in expeditions to the Holy Land. They were regularly armed with *sifoni*, with which Venetian and Byzantine mariners launched the devastating "Greek fire," a secret chemical compound which, once ignited, would not easily extinguish, even with water.

Not only do the writings of the 13th century make more distinctions in ship types than ever before, they also give more details: *battelli* were ships' boats of 30 *piede* (10.43 m.), and *gondola*, 24 *piede* (8.35 m.). Another ship's boat strong enough for use at sea was the small *schifi*. The *plactae* or *sandali* were river transports that hauled barges. Another river transport sometimes used for lighterage or lagoonal transport was the wide and flat bottomed *piatta (plato)*.

The 13th-century term *navi latine* indicated a relatively large lateen-rigged ship used primarily as a merchant ship, but also as a war transport. Minimum proportions for a small *nave* are specified in the maritime code of January 7, 1229. The keel had to be 56 *piede*. The *"lanzar in delfinis,"* the *slanzo*[55] was to be 34 *piede*. The *boca* had to be 24 *piede*, the height at midships, 9 *piede*. The patron could decide the width in *fundo* (Predelli and Sacerdoti, 1903: 51). The minimum proportions of a later and slightly larger *nave latine* are given in *Fabrica di galere*, a 15th-century manuscript preserved in the Magliabecchiano collection of the Biblioteca Nazionale Centrale in

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[55] The *lanzo* or *slanci*, called rake in English, is the difference between the maximum length of the vessel and the length of the keel (Bonino, 1978: 71). It has also been defined as the horizontal distances from where the stem and stern posts starts to rise, to a vertical dropped from the top of that post (Chiggiato, personal communication).

Florence, as follows: In a one-decked ship with a *colomba*, or keel, of 12 *passe* or 60 *piede* (20.86 m.), the *boca* (measured at the maximum curvature amidships) was 24 *piede* (8.35 m.), the *trepie* (moulded beam, or horizontal width within the bilge) at 3 *piede* above the keel, 16 *piede* (5.6 m.), and the width of the floor, 9 *piede* (3.13 m.). The height up to the deck at midships was 9.5 *piede* (3.3 m.). The length of the ship at deck level was 85 *piede* (29.56 m.), with a total length of 90 *piede* (31.3 m.) when including the *lanzo*, or *slanci* (rake), at bow and stern (Pryor, 1984, no. 2: 190).[56]

Other dual-purpose ships of the 13th century include the *navis*, *buzus*, *banzonus*, *navi buzzi*, *buzi*, *galere grosse*, and the *navi veliere*. Certain of these ships, such as the *navis*, *buzus*, and *banzonus*, were two-masted, beamy, lateeners with high sides, at least two decks, a stern castle, a fore-castle, and a fighting top (Lane, 1973 B: 46). For the first time, the various *naves* are differentiated in Zeno's code (1250) from the *tarrete* type. The statutes give different regulations for the *tarrete*, which was apparently a smaller, more slender type of lateen-rigged round ship, with probably only one deck, but sometimes oared. The *buzo naves* had two masts, and were beamy.
The 13th-century *dromoni* long ship type had two lateen-rigged masts, two levels of oars, fighting castles at bow and stern, a *sperone* (*spiron*) projecting from deck level at the bow (see p. 247), and *ali* projecting upward and inboard at the stern. Another warship, the long *galere grosse*, with approximately an 8 : 1 length to beam ratio, employed both oars and sails, and had a shelter along its middle for the soldiers. The *salandria* relied solely on sail power, as it had no oars. It was often used as a horse transport, and may have been similar to the *taride* (Pryor, 1984, no. 2: 200 and no. 4: 377).

Documents of the 14th century report an even greater number of distinct vessel types, including some specialized lagoonal craft and buoys. The *gagiandra* (*gajandra*) was a stationary buoy supporting a chain which protected the port of Venice during war. Robust buoys called *pontoni* floated equipment used to remove mud accumulated on the bottoms of canals, which were indispensable to maintain the depths adequate for navigation in the lagoon. The shallowness of the Venetian lagoon may have limited the size of Venetian ships, but it also provided a unique protection. The largest Venetian ships could only be floated into port with *cammelli* (called camels in English), flat bottomed rafts that tied to a ship's port and starboard to lift its hull and thus

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[56] *Boca*, *colomba* and *lanzo* are Venetian dialect.

reduce its draft; no large enemy ships could approach the city without these *cammelli*.

Lagoonal vessels such as the *piattone* were useful for lighterage; the *ganzaruolo*, *galaldelo*, and *perischermo* were lagoonal racing craft. The *piattoni (peatoni, plates)* were ceremonial lagoonal boats. *Scafa* were armed vessels which patrolled the lagoons.

Coastal and river craft include the *marano*, built to transport stones for the breakwater at the Lidi, and the *lembo (libo)*, large, flat bottomed, and shallow drafted.

*Burchi*, cargo barges of 9-12 tons, carried salt, oil, and wine cargoes up the rivers (Bonino, 1978 A: 69). A smaller version of the *burchi* were the *burchièlle*; these had four oars and one lateen-rigged mast.

The average *marsiliana*, a small type of *navi latine* first mentioned in the 14th century, used to carry food supplies up river; was about 10 m. long and 1.9 m. in beam.

Venetian texts first mention the *cocha* (*navi rotonde*) in 1315 (Lane, 1973 B: 123). This was a relatively flat bottomed and high-sided round ship, rigged with a single square sail and steered with a single rudder attached at the stern. The type had originated in the tidal areas of the North Sea, where it had been clinker-built. The northern cog was apparently introduced in the Mediterranean just after 1300, and soon cogs with stern rudders and square sails were being built in the Mediterranean, but adapted to the Mediterranean frame-first tradition (Scandurra, 1972: 187 and 214; Bonino, 1978 A: fig. 17). Sometimes they were fitted with a smaller lateen-rigged sail aft and a small spritsail at the bow. The medieval lateen-rigged ship with side rudders endured in Venice longer than in other areas of the Mediterranean, and the number of cogs built by Venetians was actually rather negligible. However, the arrival of the cog in the Mediterranean did have significant repercussions on the history of seafaring. A ship with stern rudder and square sail was far easier to handle than lateen-rigged ships with two quarter rudders, and a square-rigged ship therefore required a smaller crew. While a ship rigged with the lateen sail was well adapted for coastal sailing under diverse wind directions, one with a square sail was better suited for traveling with a following wind (Scandurra, 1972: 214). The most notable significance of the presence of the cog in the Mediterranean is that it led to the development of mixed-rigged ships with a stern rudder, and eventually, ships capable of ocean navigation (Bonino, 1978 A: 74 and 94).

Before 1318, there is "no clear evidence ... of a differentiation

between galleys designed for trade and those designed for war or patrol (Lane, 1963: 202 and note 110)." Between the 1290's and 1310's, Venetian long ship galleys were enlarged, and the trireme gradually replaced the bireme arrangement. The resulting merchant galleys were increasingly used for commercial cargoes, and by the 1330's, three types were distinguished, one for patrol use, and two for trade. A light galley type was built to patrol the gulf, and there were also galleys of the measures of Flanders, and those of the measures of Romania, Trebizond, or Alexandria (Lane, 1973 B: 122; 1963: 202, and note 110). Several of the ship types used for both cargo and warfare were the *navi marani, parentarie (parendarie), galere da mercanzia, galeazza da mercanzia (galea grossa)*, and *tartane*. The *galeazza da mercanzia* was a seagoing trireme with two to three vertical masts. A *tartane* normally had two lateen-rigged masts, but some *tartane grosse (tartana da guerra)* had three masts.

Fifteenth-century warships and transports include the huge *galera cetea*, the fast *galeotte*, which had one mast supplementing the manpower of 16-30 oars, and the *nave uselleria (nave uscheria, nave usseria)*, a horse transport.

This completes the overview of vessel types named in textual sources through the 15th century. In summary, this textual information would lead one to believe the following generalizations, graphed in Figure 112.[57] During the earliest phases of Venetian seafaring, when Venetian merchants were primarily occupied in river trade (5th-6th centuries), as would be expected, the majority of the vessel types mentioned are lagoonal and river craft. Most types recorded by the 9th and 10th centuries are warships; this reflects the growing concern for protection, necessary against seizure by feuding lords along the inland rivers, or the Saracens along the coasts of the Adriatic (Lane, 1973 B: 6). By the end of the 12th century, piracy had become a serious threat to Venetian seamen, who were now regularly navigating Mediterranean waters for overseas trade (Lane, 1973 B: 35). By the 14th century, a far greater diversity of types are distinguished in the texts, both small river and lagoonal craft, and larger ships, most of which are warships or dual-purpose merchant/warships. This indicates the interrelationship between trade and war; Venetians continually battled

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[57] Each type is placed in the century of its first known occurrence. The graph is merely a reflection of the variety of types mentioned in various textual sources, but in no way does it reflect the frequency of any type, nor the actual number of ships. The graph is of value simply in indicating the range of Venetian ship and boat types as revealed by the textual evidence for each century of the study.

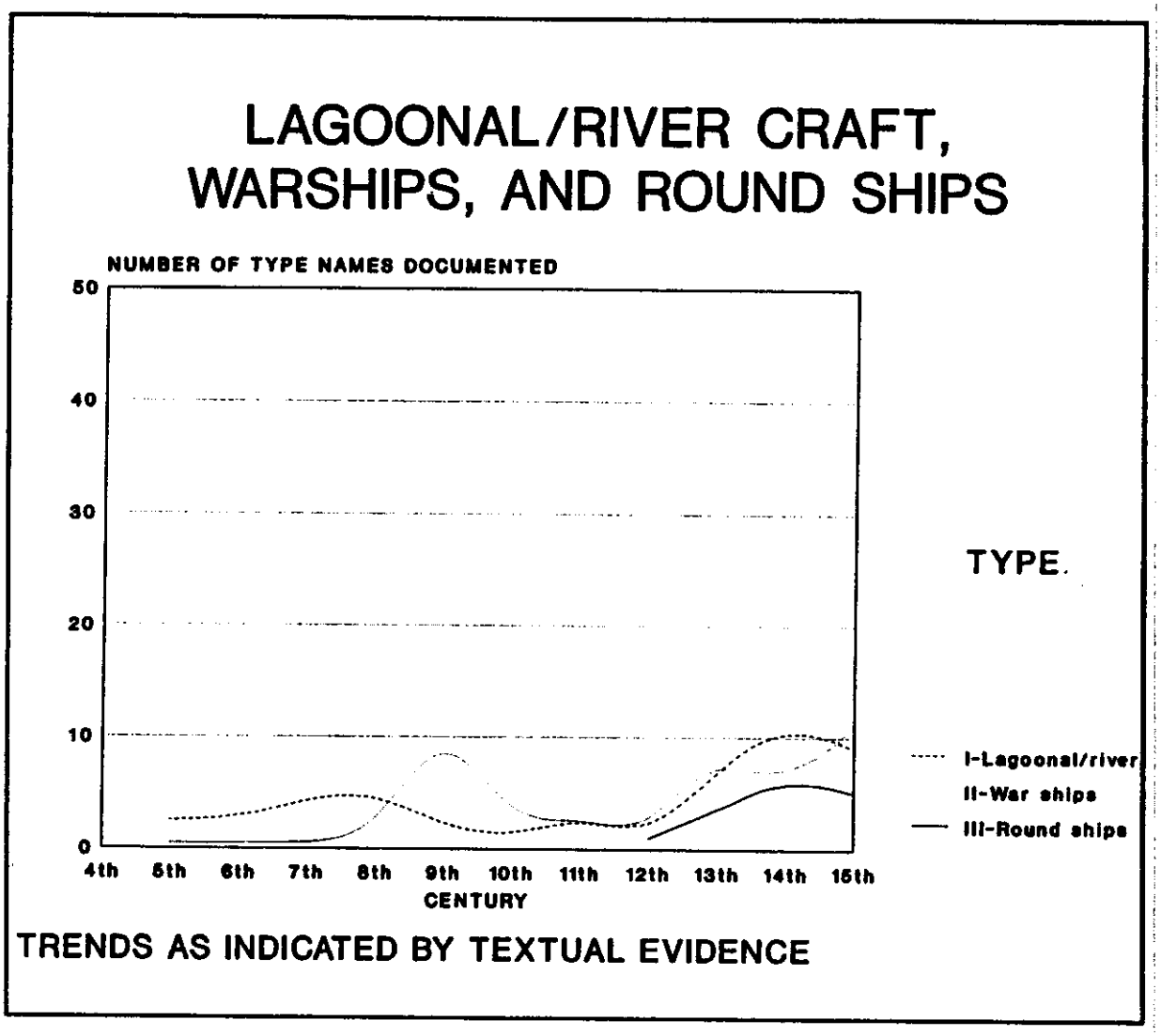



**Figure 112** Graph showing the trends of new Venetian vessel types referenced in the textual evidence of each century.

Genoa, especially, in efforts to gain trade advantages.

Although these generalizations are for the most part valid, one must consider how accurately the distinctions given in the documentary evidence reflect the wide range of watercraft types actually in use at any one time. Several problems are inherent to the written documentary sources. The texts utilized numerous synonyms for various ship types, which makes it difficult to distinguish between similar types and equivalent types. A second problem is that the descriptions given are usually generalized, and thus lack the desired clarity necessary for interpretation (e.g., the generic term *nave*). Finally, it must be recognized that government records comprise a major part of the textual evidence. Government records focus on the planning and recording of

military exploits. Naturally such sources, biased as they are toward naval affairs, mention a preponderance of warship types, and those merchant ship types suited for adaptation to military use, but rarely mention other types of watercraft less frequently.

Fortunately, an analysis of the artistic record and a development of a typology based on this body of evidence fills out the picture of medieval Venetian vessel types. Vessels of the catalog are divided into three functional types, with subtypes defined by relative size, number of masts, or use for a specific task.

**Typology of Representational Evidence for Venetian Ships and Boats**

It is never possible to match conclusively a ship representation with its historical name, although, based on the information presented in the written documentary sources, suggestions can sometimes be made. The typology presented here was developed from the sample of 166 Venetian ship and boat images dating approximately up to the year 1460 that were located in this survey. Only the first half of the 15th century was surveyed; presumably there are far more examples in the 15th century of all categories. Figure 113 graphs the results, indicating the distribution of vessel types based on this representational sample.[58] In some instances, a vessel could be interpreted as belonging to two or more categories. All efforts have been made to minimize this problem through consistency in categorization. It is necessary to remember, however, that many ships and boats were multi-functional, overlapping in their functions and making absolute distinctions impossible. Although the presented typology provides an ample overview of trends, it can only be considered a general reflection of medieval Venetian vessel types.

The three basic vessel types are the flat bottomed lagoonal/river craft (**Type I**), the long ships or warships (**Type II**), and the round ship (**Type III**). Subtypes of the flat bottomed Type I vessels (graphed in Figure 114) include lagoonal craft (**Type Ia**), lighters (**Type Ib**), fishing boats (**Type Ic**), and river boats, either war craft (**Type Id**) or river cargo boats (**Type Ie**); subtypes of the second, warship category (graphed in Figure 115) include oared galleys (**Type IIa**) and war transports (**Type IIb**). Subtypes of the round ship category (graphed in

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[58] This graph is based on the actual number of examples of each type that were located through this study of the Veneto region up to ca. 1460. It includes all versions of aggregates, where the artist has depicted more than one version of the same ship, and some vessels not illustrated.

Figure 116) have been distinguished by the number of relative masts, that is, single-masted lateeners (Type IIIa), two-masted lateeners (Type IIIb), and three-masted lateeners (Type IIIc), and, beginning in the 14th century, by new rig types, either single-masted square-rigged cogs (Type IIId), or two-masted mixed-rig round ships (Type IIIe) or three-masted mixed rig round ships (Type IIIf).

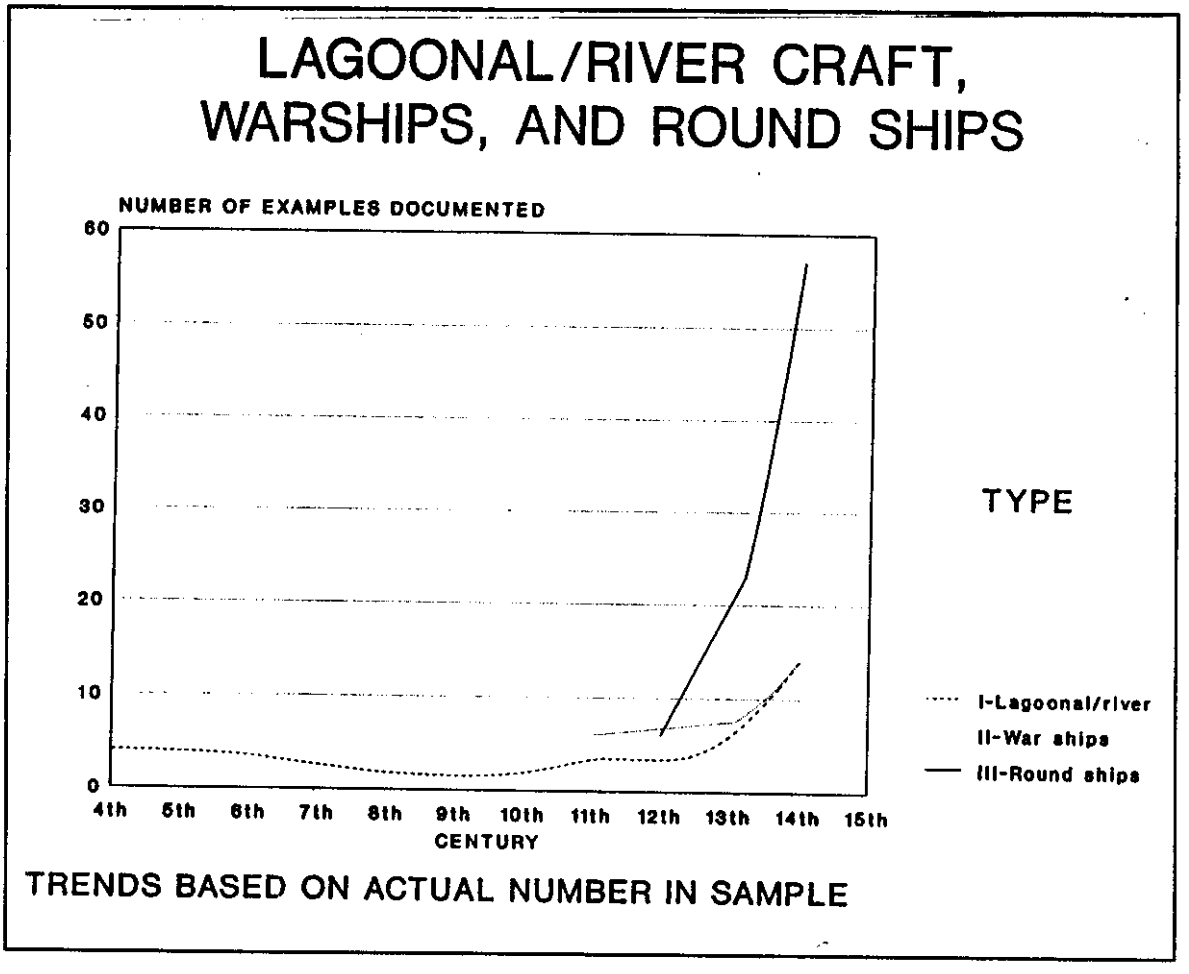



**Figure 113** Graph showing trends in Venetian vessel types, based on representational evidence.

**Type I - Flat bottomed lagoonal and river craft** (Figure 114)

Lagoonal and river craft are relatively small, flat bottomed vessels, usually undecked, although sometimes with a small deck at one or both ends. Some 46 examples were located (including Figures 2, 3, 4, 5, 8 A, 8 B, 8 C, 10, 16, 17, 23, 24, 31, 32, 34, 35, 47, 50, 52, 53, 64, 69, 71, 72, 82, 83, 85, 86, 89, 90, 93, 95, and 96), with examples dating as early as the 4th century. Archaeological examples of small

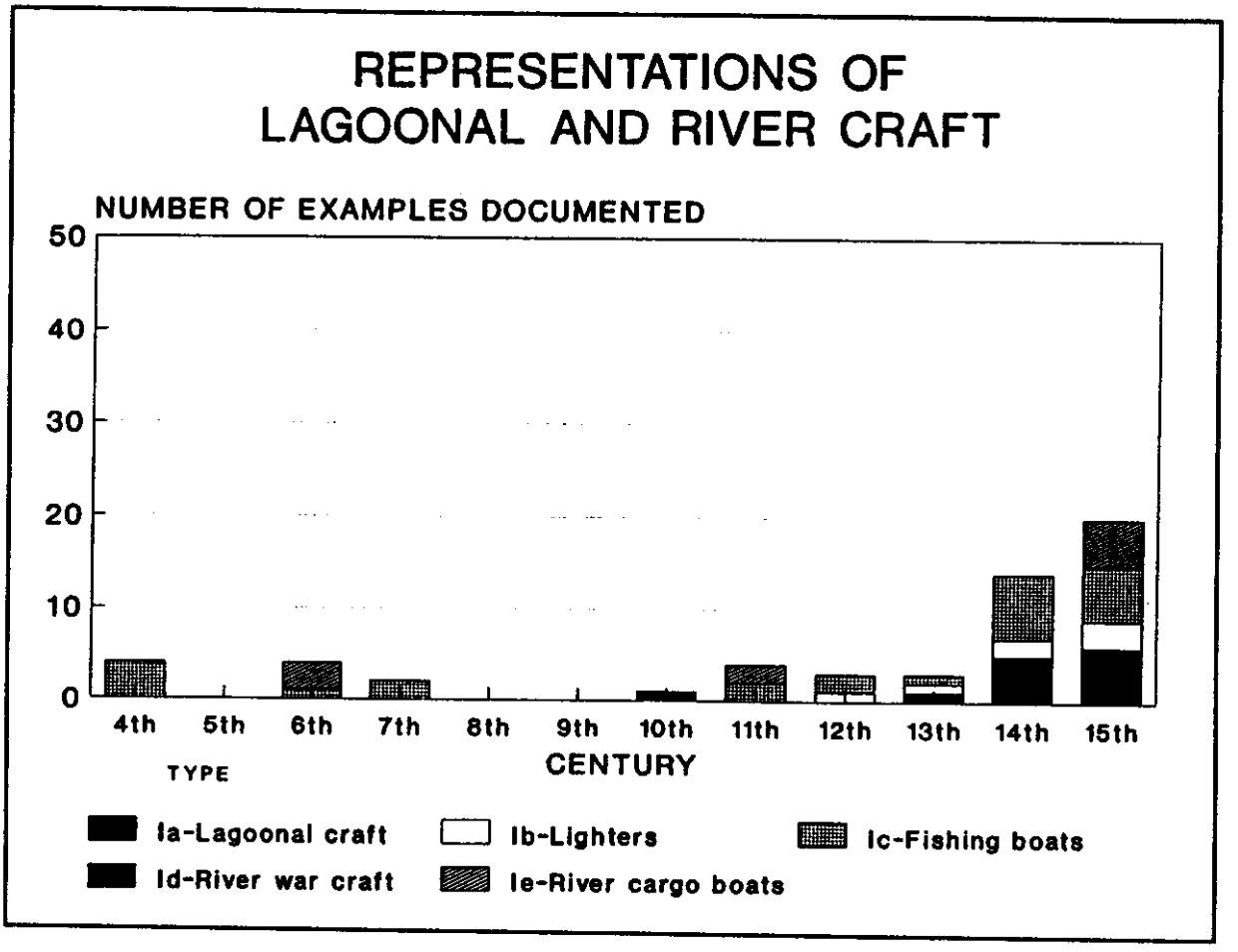



**Figure 114** Flat-bottomed lagoonal and river craft (Type I) in the sample, by century.

boats have been excavated at Cervia, Pomposa, and Pontelagoscuro (discussed beginning on p. 213).

Known names of vessels for lagoonal and river navigation are the *campolo, cursorie, rascona, scrilla* (5th-6th centuries); the first two were used within the lagoon and on rivers, the *rascona*, primarily on rivers, and the *scrilla*, mainly within the lagoons. None are distinguished in the 7th century, but in the 8th, two river types are recorded, the *sandòn*, a floating water mill, and the *scafa*, a small, towed boat. Eleventh-century texts name the *battello* and the *battana* for lagoonal navigation, and the *burchio* for lagoonal and river trade. The 12th-century *seole* was useful for lagoonal and river navigation, the *plactae* hauled barges along rivers, and the *piatta* served as lighter as

well as for lagoonal and river craft. Fourteenth-century texts mention several lagoonal racing craft, the *ganzaruolo, galaldelo, perischermo,* lighters, such as the *piattone,* a larger version of the *piatta,* bulky cargo transports, such as the *marano* and the *lembo,* armed vessels called *scafa,* which patrolled the lagoons, and the ceremonial vessel, the *plates.*

It is difficult to distinguish between various lagoonal or river craft types in representational material, unless the theme of the image clarifies the question. The distinction is of minor significance, in any case, since most lagoonal craft would have been suitable for many daily Venetian tasks. Smaller craft were doubtless used for lighterage and fishing as well as to ferry people along the canals of Venice, while larger lagoonal craft would have been used for cargo shipment, and encountered at least some river navigation, being used partway up river until different navigational conditions (large marshes, rivers, alpine lakes) prompted transference of cargo to another ship type. River craft were, however, usually larger vessels than lagoonal craft.

If no clear indication is given by the subject of the representation, one specific function of small craft depicted in Venetian art cannot always be absolutely ascertained, since most craft were, in fact, multi-functional. Nonetheless, it is possible to subdivide the lagoonal and river craft as follows: Type 1a) lagoonal craft, Type 1b) lighters, Type 1c) fishing boats, Type 1d) river/lagoonal war craft, Type Ie) river/lagoonal cargo boats.

**Type Ia - Lagoonal craft**

There is one characteristic feature which identifies a craft as a lagoonal vessel, and that is a uniquely-shaped oarlock typical to the Venetian lagoons, even to the present day. The presence of this unusual oarlock, called *forcole* in Venetian, is visible in Figure 24, Figure 47, Figure 83, Figure 86, Figure 95, and Figure 96, dating from the 13th through 15th centuries, defines these small boats as definitively Venetian lagoonal craft.[59] A *forcole* is carved out of a single block of walnut (Rubin de Cervin, 1985: 106). Although usually set toward the bow, the placement of the oarlock is not consistent in the actual boats or in images of them. Sometimes it is set forward, on either the port or starboard side (e.g., Figure 83 and Figure 96), while in other cases it is set aft (e.g., Figure 47 and Figure 95). Figure 95 shows the vessel slightly from above, revealing one strengthening thwart at about

[59] Because the themes of Figure 83, Figure 86, Figure 95, and Figure 96 relate to fishing, these vessels have been placed in Type Ic.

midships. The vessel in Figure 24 is slightly larger than the other two boats. Figure 52 contains two small boats with bluff sterns which ferry people from place to place in the lagoon.

All lagoonal craft are relatively small, open boats, although some had a half deck at bow and stern (e.g., Figure 86). Like the gondolas of today, which are used primarily for transport within the lagoons, they also would have been used as lighters or for fishing.

**Type Ib - Undecked lighters**

As discussed above, the distinction between a small lighter or service boat and a simple fishing craft is not always apparent in boat representations except where the iconography itself indicates the function of the craft. Such is the case for small boats in scenes depicting stories such as the embarkation of the relics of a saint (Figure 10 of the 12th century and Figure 71 of the 15th), or other portrayals of loading scenes (Figure 50 of the 14th century), which are clearly intended to illustrate lighters.

The examples of lighters in this catalog (Figure 10, Figure 23, Figure 50, Figure 71, and Figure 85) resemble each other in the shape of their bows and sterns. All are open, undecked boats. The lighter in Figure 10 is shown being maneuvered by a mariner with one steering paddle at the starboard quarter. Presumably the lighter in Figure 50 was maneuvered in a similar manner. Details are not clear due to deterioration of the manuscript. Figure 10 (1100-1150) may represent the *saica* mentioned in texts of the 11th century, or the *seole* mentioned in 12th-century texts. Figure 50 (14th century), Figure 71 (15th century), and Figure 85 (15th century) may represent the *seole*, or perhaps the *piatta* first mentioned in 1283 (Casoni, 1847: 204 and 209).

**Type Ic - Undecked fishing boats**

Depictions of the Miraculous Draught of Fishes (Figure 16 of the 12th century, 15th-century Figure 86, and 7th century (?) Figure 89), the Calming of the Storm (Figure 17 of the 12th century), Peter Walking on the Water (Figure 5 of the 6th century and Figure 82 of the 14th), or Fishermen (Figure 2, Figure 3, and Figure 4 of the 4th century, Figure 92 of the 13th century, and Figure 64 of the 14th century) are obviously intended to represent fishing boats.

The fishing vessels of the catalog show vast diversity. The earliest examples, from the 6th century (Figure 2, Figure 3, and Figure 4), are two types of Roman fishing craft. The smaller vessel, in Figure 2, has a flat stern and inward curving bow, and represents the

*horeia* type (Casson, 1971 B: fig. 137, #20). The other two, in Figure 3 and Figure 4, are of another distinct type: double-ended, with the stem ending in the typically Roman swan's head (cf. Throckmorton, 1972: fig. 2).

The next variety of small fishing craft is exemplified by Figure 5, Figure 32, Figure 35, Figure 72, Figure 83, Figure 92, Figure 95, and Figure 96. Dating to the 6th through 15th centuries, through seven centuries in all, these representations attest to the continuation of a simple, small, undecked, multi-purpose type craft. The only depicted difference between the Byzantine (Figure 5) and early medieval boat type is that the Byzantine mosaic represents three beams at the sheer strake; such strengthening of the later medieval boat, if it existed, was not indicated in any of the later examples. Otherwise, the vessels are all nearly identical, and reflect the characteristics of the 6th-century *scrilla*, which may have had a lateen sail, and the 13th-century lagoonal *battello* or *gondola*.

Two other fishing boats, in Figure 16 and Figure 17, represent another distinct variety of open fishing vessel characterized by a squared stern. The number of oars employed varied depending upon the size of the vessel and the needs of the particular journey. Figure 16 and Figure 17 may represent the *seole*, or perhaps more generally, simply a small fishing vessel with a blunt stern.

The fourth and final variation of the fishing vessel category is exemplified by the boats of Figure 64, Figure 86, and Figure 89. These are the largest fishing craft of the catalog, characterized by an afterdeck, and navigated either by rowing, punting, or with a small lateen-rigged sail positioned far forward on the bow.

**Type Id - War boats for lagoonal or river use**

A 10th-century example of a river or lagoonal war craft is seen in Figure 90. It has either a watch tower or a single mast set far forward, and a cabin or tented area at midships. The three oars shown aft on the starboard side, with four more set amidships must have made this craft quite maneuverable either for lagoonal or river navigation. Although a legend under the craft labels it as a *chelandia*, an oared warship used to patrol the lagoons, in many respects, it resembles a lagoonal and river cargo vessel, the *burchio*, frequently depicted in later Venetian art, such as Figure 69, a fresco by Pisanello (ca. 1430). The profile of the bow of Figure 90 resembles that remaining from the 11th-century boat of Pomposa (believed to be of the *burchio* type), where the flat bottom curved smoothly into the stem, as seen in both the

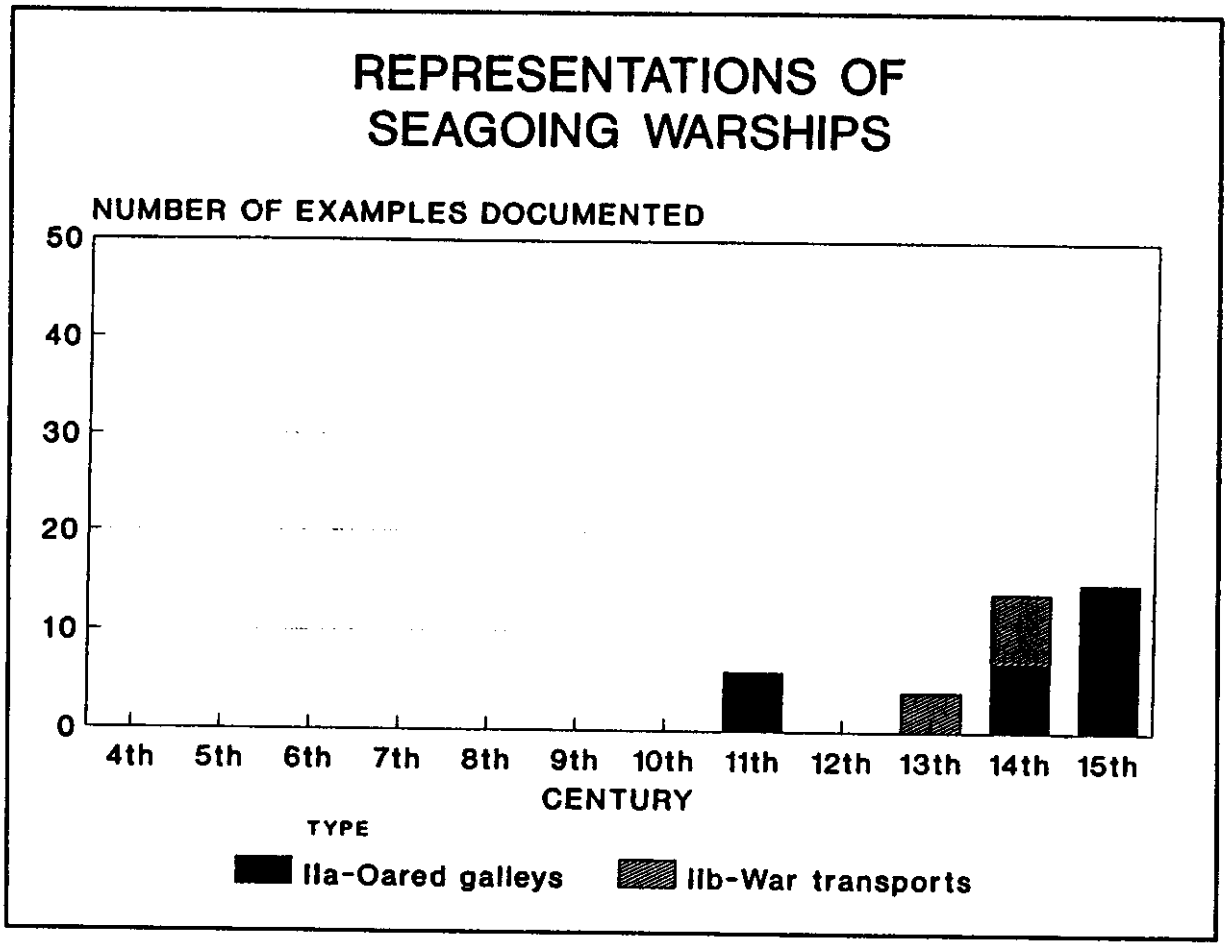



**Figure 115** Warship types (Type II) in sample, by century.

*chelandia* of Figure 90, and the *burchio* of Figure 69.

**Type Ie - River/coastal lagoonal cargo craft**

The three vessels in Figure 8 A, Figure 8 B, and Figure 8 C, from a 6th-century mosaic depicting the Port of Classe, represent a type of medium-sized river cargo transport, perhaps the *rascona* type, which accomplished river trade on the Po. These vessels have one mizzen mast. The one visible unfurled sail is enigmatic, but the sail is square. The relatively flat bottomed craft in Figure 31, Figure 34, Figure 53, and Figure 69, all with a single lateen-rigged mast, are probably also medium-sized river craft.

Evidence for a river craft type not represented in this sample has been discovered at Pontelagoscuro (discussed on p. 214). The ship planks discovered are flush-laid and secured with mortise-and-tenon joints. The bow angles sharply upward from the flat bottom (Figure 103). According to Bonino, this boat was of the *sandòn* type,

used as a floating water mill on the Po and Adige Rivers, and may have originally measured approximately 15 m. in length with a beam of 5 m. (1978 A: 55).

**Type II - Long ships or warship galleys** (Figure 115)

The most basic distinction to make between the remainder of the medieval vessel types is that of the long ship, a warship primarily propelled by oars (Type II), and the round ship, a sailed cargo vessel (Type III). To some extent, their functions merged: all ships were used as war ships when the need arose, and some rowed galleys were employed to carry precious merchandise when speed and security were desired.

Medieval warships can be divided into two functional types: Type IIa - oared galleys, propelled primarily by oar, and Type IIb - war transports, which used mainly sail power, or were towed into position by oared galleys (Marzials, 1965: 37). The transport was closer in hull shape to a round ship, while the medieval war galley was similar in most respects to Classical galleys (with a length to beam ratio of about 8 : 1), except for its new bow shape (Rubin de Cervin, 1985: 30). The bow of the medieval galley had a sort of bowsprit the Venetians called *sperone* or *spiron*. One purpose of this projection was to allow the foreyard to be hauled farther forward, thereby improving the vessel's sailing qualities by making the ship more weatherly (Rubin de Cervin, 1985: 30). A secondary function of the projection was as a boarding platform, essential since boarding was the primary offensive tactic.

Warship names given in the texts include the *acazie, liburniche* (both in 5th- and 6th-century texts), *tarete, navi lunghe, bucintoro* (7th- and 8th-century texts), *chelandia, navi oneraria, dromone, nave turrita, ippagoghi, navi belliche, navi castellate, panfile, galee* (9th-century), *usserii, arsilii, cumbarie, chelandia* (10th-century), *galea lunga* (11th-century), *brulotto* (12th-century), *navi latine, buzi, navi buzzi, dromoni, galere grosse, navi quadre, navi veliere* (13th-century), *galeazza da mercanzia, galeazza grossa, galere da mercanzia, navi marani, parentarie,* and *tartane, tartana da guerra, galera cetea, galeotte, nave uselleria* (14th-century). Certain vessels, including the *acazie, liburniche, tarete, navi latine, buzi, navi buzzi, galere grosse, navi veliere, galeazza da mercanzia, galere da mercanzia, navi marani, parentarie,* and *tartane*, were dual-purpose, warship/merchant ship. The archaeological discovery of a 15th-century galley found at Lazise, Lake Garda (discussed on p. 227), is a rare early example of a Venetian galley.

Thirty-seven ships of the catalog can be designated as warship types (in Figures 18, 19, 20, 21, 27, 30, 33, 36, 38, 39, 40, 46, 48, 49, 51, 52, 53, 54, 55, 72, and 98); Twenty-six of these are oared galleys, and date from the 11th to the 15th centuries, and are propelled by oar. Considering the political situation of Venice, and her frequent need to engage in naval battles, relatively few of the images located during this study are warships. It must be emphasized again that Venetians employed their merchant ships as warships, and most of the vessels placed in Type III could have been converted for martial use. Also, the previously discussed textual evidence confirms that there was, in fact, a predominance of warship types throughout the centuries of this survey. The few representations of warships in the catalog, however, do display unique features, which characterize many distinct subtypes.

**Type IIa - Oared galleys**

Figure 27, Figure 30, Figure 33, Figure 36, Figure 38, Figure 39, Figure 48, Figure 52, Figure 53, Figure 55, Figure 72, and Figure 98 contain oared galleys.

The two earliest examples of warships in the catalog date to the 11th century and are both stylized. Figure 33 portrays two double-ended, small, oared vessels with rounded hulls, propelled with eight and ten oars per side arranged in one level. Figure 30 also dates to the 11th century. These double-ended hulls have an unusually shaped stern (semi-triangularly shaped sections projecting to port and starboard almost look like a pair of wings), but the basic shape of the hull is a common one (e.g., Figure 31, Figure 35, and Figure 36).

Figure 36 (not Venetian) portrays a 12th-century bireme galley with *sperone*. The oars are arranged in two levels, with the lower oars passing through ports, and the upper oars resting on an outrigger. The triangular projection at the stern may be equivalent to those seen in Figure 30, but here positioned downwards.

Figure 27 (ca. 1300) shows a smaller oared galley, arranged *a zenzile* in rowing groups of two. No masts are shown. Figure 48 (early 14th century) shows a similarly-sized galley during battle; its *sperone* at the main wale level projects at the bow. Since the fighting occurred on deck, the oars have apparently been stowed away in this depiction. No masts are represented. Vessels in Figure 38 and Figure 39 each have one bank of oars. That in Figure 38 has no *sperone*, but does have a fighting deck, while that in Figure 39 has a *sperone* but no fighting deck.

Figure 31 (11th century) represents four two-masted warships in the midst of the siege of Constantinople. Similar trireme galleys with *sperone*, rowed *a zenzile* in groups of three, with the possibility of raising one to three lateen sails to augment rowing, are included in Figure 52, Figure 53, and Figure 54.

Figure 27, Figure 52, Figure 53, Figure 54, Figure 59, and Figure 60, although dating several hundred years apart and differing in other respects, depict identical systems designed to support a tent at the stern. Two Y-shaped stantions, set vertically, support a transverse bar over which a canopy could be draped. This was probably a common feature of many galleys that did not have permanent stern-castle structures.

The galley in Figure 98 (Levi, 1892: Pl. XX, fig. 44.1) is of uncertain date, although, based on the presence of cannon in the bow, it must date after the first quarter of the 14th century. It is a *galera* with oars stowed, its lateen sail providing all means of movement.

Naval historians have varying opinions concerning the rowing system of Venetian triremes. According to Rubin de Cervin, Fincati said the final word on the matter when he pointed out that Venetian documents from the 13th through mid-16th centuries always specify "*galee da tre remi e tre homini per banco.*" They were rowed with three men to a bench, each with his own oar. To row, they would have had to stand and then sit (Rubin de Cervin, 1985: 31-32).

**Type IIb - War transports**

This category contains few examples, partly since war transports are difficult to distinguish from round ships in representational images. The themes of Figure 18, Figure 19, Figure 20, Figure 21, Figure 40, Figure 46, Figure 48, Figure 49, and Figure 51 reveal the vessels depicted there to have been used as war transports. They closely resemble one- and two-masted lateen-rigged round ships, although they were specifically designed for warfare: they had horse ports which opened, and a bridge was let out, allowing knights to land mounted (Marzials, 1965: 68).

The mosaics of Figure 18, Figure 19, Figure 20, and Figure 21 (ca. 1235) represent a type of round ship employed as a crusader transport. Although the mosaic depicts only one side rudder to starboard (which would have doubled as a steering leeboard), presumably the ship had a pair of rudders, and the second rudder to port could be let down when required. These vessels have the distinctive *ali*, inward curving projections at the stern, delimiting the very full stern, which must

have provided for ample tonnage. This type was apparently well-suited for conversion to siege machinery; the spars have been employed to form "flying bridges" or scaling ladders (Lane, 1973 B: 40 and Marzials, 1965: 70).

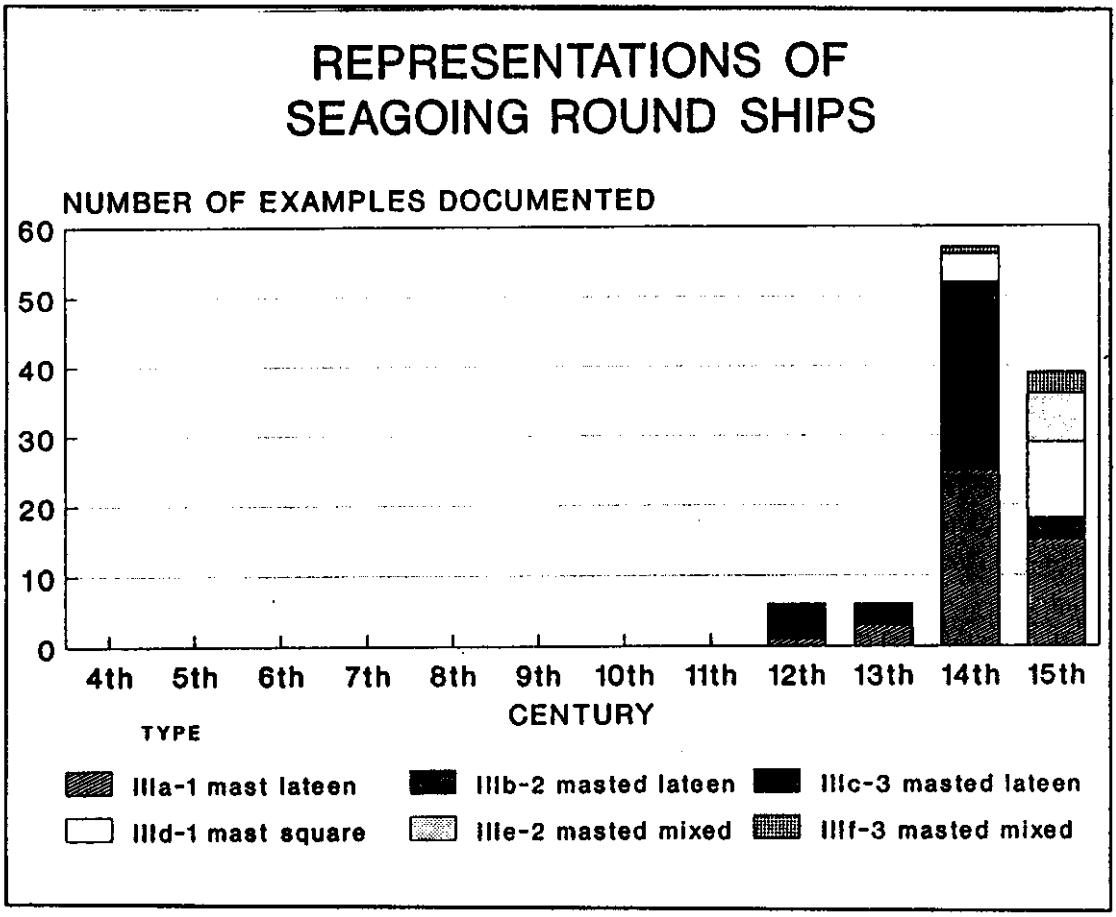



**Figure 116** Round ship types (Type III) in the sample, by century.

**Type III - Round ships** (Figure 116)

The medieval round ship shows characteristics that link it to its bulky predecessor, the Roman *corbita*. The majority of the ships in this catalog are some form of the round ship, with one or more lateen-rigged mast. They were primarily employed as a merchant vessel, although in times of need served as a warship. Round ships of the catalog are seen in Figures 10, 12, 13, 14, 15, 23, 25, 26, 28, 29, 37, 41, 42, 43, 44, 45, 50, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 66, 67, 68, 70, 71, 72, 73, 74, 76, 77, 78, 79, 80, 82, 84, 85, 87, 92, 94, 96, and 97.

These large sea-going ships range in date from the 12th century through the end of the sample taken.

The catalog's round ships can be subdivided into six categories based on their relative size (determined by the number of masts) and rig type, with sub-categories as follows.

**Type IIIa - Single-masted lateen-rigged round ships**

Sixth-century boats of Figure 8A, Figure 8B, Figure 8C, and the 11th-century Figure 31, categorized as river craft, could also have been designated as small coastal round ships. Single-masted lateen-rigged round ships of the catalog include Figure 25, Figure 29, Figure 42, Figure 44, Figure 45, Figure 58, Figure 59, Figure 66, Figure 70, Figure 71, Figure 72, Figure 85, Figure 91, and Figure 93.

Figure 93 (late 13th century) represents a small, single-masted boat, with one steering oar or quarter rudder shown at starboard. Its small size is indicated by the fact that it has one mast and is manned by just two mariners. Although the boat of Figure 91 does not yet have a mast in place, the similar shape of its hull probably indicates it, too, would have been fitted with a mast. Another single-masted boat type, seen in Figure 29 (ca. 1345), is slightly larger, with a couple of steering paddles at both bow and stern.

The classification system used in the typology of this catalog generally makes distinctions based on the number of masts and type of rig. However, in the cases of the single-masted ship in Figure 25 and the two-masted ship in Figure 23 (both of which date to ca. 1270), the basic hull shape and stern configuration place these two vessels in the same general type, not into distinct categories. Masts for the vessel of Figure 91, since it is part of a construction scene, were not defined by the sculptor, but the railing at the small quarter-deck and the general shape of the hull resembles those of Figure 25 and Figure 93, and it represents a similar single-masted vessel.

Other small, single-masted ships in the catalog include those in Figure 42, Figure 44, and Figure 85. Figure 85 (15th century) is highly ornamented and decorative, and details of the actual ships are difficult to make out. The ships in Figure 42, Figure 44, Figure 45, and

Figure 49 (14th century) have a small quarter-deck, and appear to be more realistic, although they are probably smaller than they were in actuality.

Larger, single-masted lateeners are exemplified by Figure 59, Figure 66, Figure 68, Figure 70, Figure 71, and Figure 72. Although still lateen-rigged, Figure 59 has a curved stern rudder attached to the stern, as well as two quarter rudders.

**Type IIIb - Two-masted lateen-rigged round ships**

Two-masted ships constitute a good number of the representations in this catalog (Figure 23, Figure 26, Figure 28, Figure 37, Figure 43, Figure 50, Figure 56, Figure 57, Figure 63, Figure 67, Figure 73, Figure 74, Figure 76, Figure 78, Figure 79, Figure 80, Figure 81, Figure 82, Figure 84, and Figure 94). Two archaeological examples of two-masted lateen-rigged round ships have been found: the ship from Contarina (ca. 1300; p. 216 and Figure 107) and the Logonovo boat (ca. 1400; p. 227 and Figure 110) give further details on the type.

The first subcategory is characterized by its common bow and stern shapes. As seen in Figure 28 and Figure 73, the sheer strake takes a sharp uprise (rather than a smooth rise as seen in Figure 25 and Figure 82) before it finishes into the post. The hull either bulges at the stern (Figure 26 [ca. 1300], Figure 28 [ca. 1300], Figure 73 [ca. 1345], Figure 74, Figure 43, Figure 94), or rises smoothly (Figure 37 [ca. 1255]), Figure 57, Figure 67, Figure 78, Figure 79, Figure 80, and Figure 81 [1318-1358]). In some cases, planks sweep upward at the stern, running parallel to the keel (e.g., Figure 26), while in other vessels, the planks forming the stern appear to run parallel to the keel below the level of a transverse beam, but perpendicular to the keel above it (e.g., Figure 37). In either case, the stern is somewhat flat, a type of transom stern with two upright framing timbers and a tragent the transverse beam to support the large stern castle. Figure 26 and Figure 28 (ca. 1300), two illustrations of one story or theme, portray the same ship, as do Figure 73, Figure 74 (ca. 1345), Figure 78, Figure 79, Figure 80, and Figure 81 (1318-1358). Figure 78, a construction scene of a round ship, shows the inner framing system used.

A smaller type lateen-rigged round ship is represented by Figure 50, Figure 82, Figure 84, Figure 76, and Figure 2 3. These ships are characterized by a substantial quarter-deck with a rounded parapet, and a full, rounded, hull shape. The quarter-deck construction can best be understood through comparison to Figure 71, a mixed-rig vessel. The angle of view depicted in this fresco clearly shows the quarter-deck

arrangement: a rectangular section is partitioned off, and decorated with finials at each corner. Outside of this, a rounded parapet completely surrounds the stern at the level of the quarter-deck.

Figure 23 closely resembles the ship of Figure 25, which has only one mast. These appear to be different-sized vessels of the same basic type.

A final example of a two-masted lateen-rigged round ship is that of Figure 63 (13th century). This vessel is provided with a high castle at the bow, and a large enclosed quarter-deck at the stern.

**Type IIIc - Three-masted lateen-rigged round ships**

Interestingly, more than half of the three-masted ships located (the largest type represented: Figure 10, Figure 12, Figure 13, Figure 14, and Figure 15), are among the earliest representations in this catalog, dating from the 12th century. Most representations in the sample depict single or two-masted vessels, or vessels with no masts. Figure 60 and Figure 61, Figure 62, of the 15th century, were the only other three masted lateeners located.

The ships of Figure 10, Figure 12, Figure 13, Figure 14, and Figure 15 are almost identical. The only perceivable difference is that a section of the side of the ship in Figure 15 is lowered, probably to facilitate unloading. The foresail is the main sail in these three-masted ships, and is generally the tallest and largest. Confusion on the part of the mosaicists or of later restorers is likely the explanation for the inconsistent relative mast heights seen in the San Clemente series (Figure 10, Figure 12, Figure 13, and Figure 14).

**Type IIId - Single-masted, square-rigged cogs**

Cogs, fitted with a single stern rudder and rigged with a square sail, make their appearance in Venetian images as well as in the Mediterranean in the 14th century. The first two Venetian examples, seen in Figure 68 and Figure 77, have a hull shape very reminiscent of the lateener. More characteristically cog-shaped are those in Figure 52, Figure 54 and the background of Figure 87.

**Type IIIe - Two-masted, mixed-rig round ships**

Soon after the cog was introduced in the Mediterranean, the mixed-rig evolved, combining advantages of both the square and lateen systems. A few examples of these are seen in Figure 53.

**Type IIIf - Three-masted, mixed-rig round ships**

The mixed-rig frequently employed up to three masts during this period. The ship of Figure 41 (1366) is an early example of this type, more common in the following century. Our catalog has few examples, including Figure 62, Figure 87, and Figure 97. Abundant examples can be found from the second half of the 15th century, not considered in this sample.

The representations in this catalog demonstrate that certain vessel types are predominate in art, for any given period. Vessel types connected with mercantile activities were more popular with medieval Venetian artists than other types, or were more appropriate for the purposes of their art; "apparently ship meant commerce, not war, to the average citizen of the medieval world." Hagiographic cycles, for example, which were such popular themes in medieval art, understandably include merchant ships rather than warship types, since saints would have traveled on merchant ships and not warships (Kreutz, 1976: 109). Thus, in medieval Venetian art, merchant round ships are represented much more frequently than any other type, although representations of long ships, various coastal craft and river boats, albeit more rare, exist. The medieval Venetian artistic record clearly does not reflect a precise proportion of the different types actually in use. Perhaps more precise proportions can be gleaned from a study of the city seascapes which became more popular beginning in the second half of the 15th century.[60] But, fortunately, the medieval artistic record of Venice does provide pictorial examples of many of the ship and boat types commonly used in medieval Venice for which textual and archaeological evidence is scarce.

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[60] For example, one xilograph, the city scape of Venice, from *Peregrinationes* (made by Breydenbach of the Bishop of Mainz' pilgrimage to the Holy Land in 1483) contains a total of 58 Type I small craft, (including 57 double-ended craft, three with masts, and only one blunt-stern boat), 6 Type II war galleys, and 26 Type III round ships.

## Stern Variations

The types of sterns appearing in this representational sample can be described as being one of two basic forms, either that seen in a double-ended hull, with a "pointy" stern roughly equivalent in shape and space to the bow, or a hull with its stern fuller than its bow, often transom or flat-ended (see Figure 117).

The relatively narrow hull of the double-ended types has only a minimal deck at the bow or stern (if any at all), and the symmetrical ends of the hull either protrude (as in Figure 47, Figure 89, Figure 90, and Figure 93) or bend inward (as in Figure 5, Figure 8 A, Figure 8 B, Figure 8 C, Figure 24, Figure 30, Figure 34, Figure 35, Figure 65, Figure 83, Figure 95, and Figure 96). The hulls of Figure 64 and Figure 69 both protrude, and resemble the *rascona* type (Figure 110), but only Figure 69 shows the extremely flat bottom continuing into the flat panel front of the bow (rake). In a double-ended hull, the rows of strakes generally run parallel to the keel and finish at the sternpost. All vessels of this sample which are unquestionably double-ended are small boats. Archaeological evidence, however, provides an example of a larger double-ended hull in the first ship of Contarina; doubtless there were actually many large double-ended ships.

Characteristics of vessels with the stern fuller than the bow differ depending on the size of the craft. Small boats with a flat-ended stern include Figure 2, Figure 16, and Figure 92, and, with an extra high sternpost, Figure 3, Figure 4, and Figure 17. Byzantine Greek manuscripts contain numerous examples of a small craft with two or three tine-like features at the stern. This must indicate the presence there of a fuller area flanked by a relatively flat-ended stern (as seen in Figure 31, Figure 32 [Figure 117 B], and Matthews, 1983: figs. 22, 23, 24, 29). The angle depicted in Figure 32, an illumination from the same 11th-century manuscript as Figure 31, shows the inside of the stern of a two-tine vessel: two sturdy upright timbers frame a flat-ended stern.

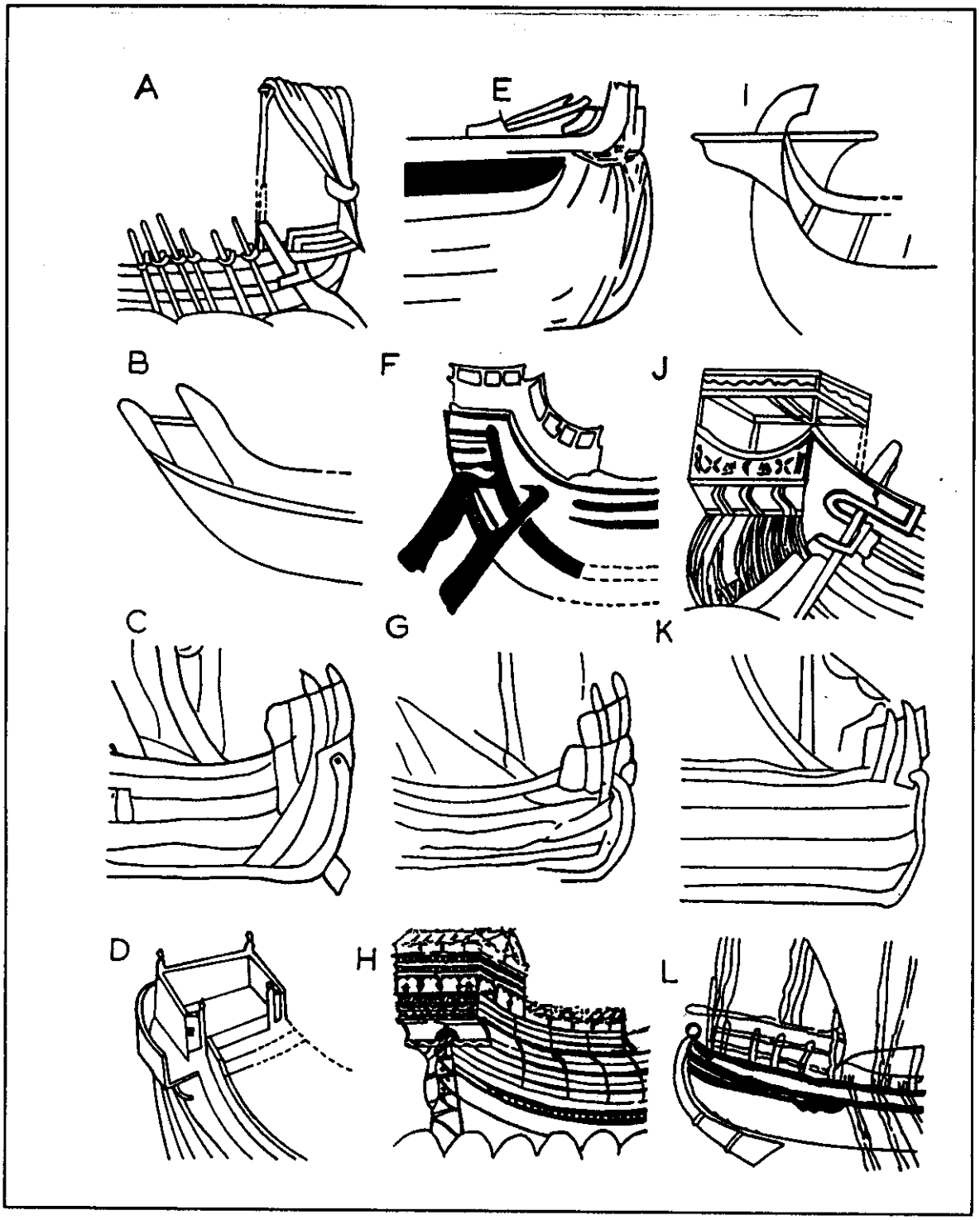



**Figure 117** Details of stern configurations represented in the sample (Drawing by Rob Barras).

A) Figure 27. B) Figure 32. C) Figure 18. D) Figure 71. E) Figure 46. F) Figure 37. G) Figure 20. H) Figure 62. I) Figure 30. J) Figure 26. K) Figure 21. L) Figure 60.

Larger ships had a more substantial quarter-deck or sterncastle structure, and to support this, they had a fuller shaped stern, either rounded or transom-like. This fuller shape was apparently accomplished either by working the straking at the stern into both the sternpost and a horizontal *trigànte* beam, which finished the upper limits of a small quarter-deck area (as seen in the rounded stern vessels, Figure 51, Figure 71, and Figure 94), or by running the strakes parallel to the sternpost and finishing them into the tragent which supported a more substantial sterncastle structure (like that seen in Figure 26, Figure 57 [Figure 117 F], Figure 46 [Figure 117 E], Figure 62 [Figure 117 H], Figure 74, and Figure 94).

Some of the larger rounded stern type ships depicted have an inward curving stern which forms the rounded stern with a small quarter-deck area (as in Figure 51, Figure 66, Figure 71, Figure 74, Figure 82, and Figure 94). In some cases, this quarter-deck is apparently quite small, and in art is portrayed in profile with a triangular form on each side of the quarter-deck, as seen in Figure 23, Figure 25, Figure 30, Figure 39, Figure 40, and Figure 91 (cf. Matthews, 1983: 30, fig. 10). I believe that the triangular shape represented is part of the vessel's rudder mount system, which was attached after the hull was almost completely constructed. This is evident through comparison of two figures which represent the same vessel type, Figure 91, shown under construction, and Figure 25, a vessel completely constructed and under way. In Figure 91, no triangular rudder mount system has yet been attached, while in Figure 25, the triangular shape is part of the mount system.

Other ships with a rounded bluff stern show a more substantial superstructure supported at the stern. What appears in profile representations of ships as a rectangle at the stern (Figure 42, Figure 48, Figure 49, and Figure 50) is a simplified portrayal of the type of stern quarter-deck best seen in Figure 74 or Figure 77. Figure 42 has this simplified rectangular shape on the quarter-deck, but unlike similar rectangular quarter-deck representations (such as Figure 27 and Figure 48), in this representation, the supports under the transverse beam are indicated. Frequently people are depicted standing or sitting in this area (Figure 27, Figure 42, Figure 48, Figure 49, and Figure 77). If there is to be ample space for a human in this area, the hull cannot possibly narrow as does a double-ended craft; the stern shape must be more rounded and full. If the sterns of Figure 79 and Figure 80, two painted versions of the same vessel, are compared, then it becomes obvious that ships whose quarter-decks are depicted as a

simplified rectangle (e.g., Figure 48 and Figure 80) and those more accurately representing the quarter-deck complete with its triangular-shaped rudder mount system in profile (e.g., Figure 26 and Figure 79), the stern types are one and the same, merely seen from a slightly differing angle and portrayed with differing degrees of accuracy. Ships with this type of rounded stern supporting a moderately sized quarter-deck include Figure 26, Figure 27, Figure 38, Figure 42, Figure 46, Figure 48, Figure 49, Figure 74, Figure 78, Figure 79, Figure 80, and Figure 80.

The final type of stern seen on large ship types with the stern fuller than the bow is the protruding transom stern, many detailed in Figure 117 (B-H, and K). The "squared-off" transom stern may have been formed in one of two ways, with either two or three frames.

The continuations of two wales, either originating low in the hull (as in Figure 18 and Figure 37) or from the uppermost wales (Figure 29), sweep upward at the stern, to form the outer side frames of the transom, filled in with horizontally-set planking, similar to the construction of the ship discovered at Pantano Longarini (Throckmorton and Throckmorton, 1973: fig. 10-11). Extensions of these wales may explain the curious inward-curving posts seen in many medieval ship depictions (such as Figure 10, Figure 12, Figure 13, Figure 14, Figure 15, Figure 29, Figure 36, Figure 39, and Figure 85). Perhaps these were the *ali*, more fully discussed below. In any case, the depiction of either a pair of wales or posts at the stern conclusively indicates that the vessel had some sort of transom stern which would have provided for an ample sterncastle area.

On some ships, three posts are apparent. I think this indicates two outer frames, the *ali* discussed below, plus a sternpost. If this is so, the shape of the hull may have been pointed along the lower part of the stern, where straking fit into the sternpost, but fuller above the tragent, with the two posts serving as exterior frames, providing the outer limits of a square sterncastle area. This seems to be the case in Figure 18, Figure 20, Figure 21, and Figure 31. In one example, Figure 46, the continuation of the uppermost wale provides framing for a tent at the stern while the sternpost fulfills its normal function.

Two inward-curving timbers at the stern are probably the most enigmatic feature recognizable in medieval ship representations (see, for example, Figure 13, Figure 16, Figure 18, Figure 20, Figure 21, Figure 29, Figure 31, Figure 36, Figure 37, Figure 43, Figure 46, and Figure 85). They apparently constituted the outermost port and starboard timbers of a transom-like stern. I believe these timbers are

the *ali* mentioned in texts. They varied slightly among differing ship types, but in representations of vessels of all sizes, the two pointed features seem to define the outermost limits of the stern and to provide the structural timbers associated with a transom-like stern. On larger ships, they were evidently important structural timbers that had an additional specific function, while in smaller vessels (such as those depicted in Figure 16, Figure 29, Figure 31, and Figure 43), they probably represent simply one of several methods used to construct a transom-like stern.

In view of Figure 18, Figure 20, Figure 37, and Figure 85, I believe the *ali* seen on at least some of the larger round ships used as Crusader transports were the jambs of a horse port located at the stern. Thirteenth-century archival evidence corroborates this position for the horse port, although clearly a horse port could have been positioned at other parts of the ship in other cases or at other times. Records from the archives in Sicily (which were destroyed in World War II) included some letters dating from 1270-1300, from Count Charles of Anjou, specifying details for the construction of his *taride* at Brindisi. One dating from May 1, 1278 reads as follows:

> ... there should be ports on the deck above just as is suitable and as is the custom in other *tarida*. Item, there should be one port at the stern of the *tarida* for embarkation and landing of men and horses; which port should be eight and a half *palmi* high and five and a half *palmi* wide. That port should be able to be closed with two very strong doors and those doors should have false beams so that where the *tarida* is weak because of the large openings of the ports, it should be strong because of the beams. And that port at the stern of the *tarida* should [have] a good strong swinging door. Item, at the stern in the space where it is usual to stow things, the deck beams should be doubled and six quite strong ones should be built in made of good oak or ash or elm; which beams are syonte as the Provencals say. Item, it should be rounded at the stern so as to allow a horse to be able to embark and land saddled and armed. (Sicily Reg. Ang. 1 [1268, A], fols. 112r & 153r-v, as translated by Pryor, 1982, no. 2: 115).

From this document, and several others almost identically worded, it is certain that the horse transports from the times of Count Charles I at least had their horse ports as part of a specially constructed stern, which was to be fortified with two "false beams" (which must have been the posts depicted in some of these representations) in addition to the sternpost (Pryor, 1982, no. 2: 106). The stern ports were apparently closed with both an inner and outer door. Both opened vertically. The inner door, called a *bactiporta* or *battiporta*, was hinged at the top and locked by a bar on the inside (Pryor, 1982, no. 2: 119). The outer door was probably also hinged, but at the bottom, and

after being pulled closed, was caulked to make it watertight. The upper continuations of the *ali* may have been used to facilitate this task (Concina, personal communication). According to Pryor, stern horse ports could have been used for beach landings on any vessel that was rowed, but a pure sailing vessel such as that depicted in Figure 85 would have had to load and unload horses at a wharf (1982, no. 1: 18).

### Steering Devices and Their Mounts

The development of the rudder during the medieval period has been thoroughly studied by Mott (1991) in *The Development of the Rudder, A.D. 100-1600: A Technological Tale*, to which interested readers should turn for further details. His study provides a good basis from which the steering systems of this catalog are analyzed.

The ability to steer is obviously necessary to any watercraft. Integral parts of a steering device include the blade, the loom, and, at least on all larger craft, a system for mounting the steering device to the hull and allowing it to be controlled. The blade shape can be symmetrically balanced, either rounded, elliptical or rectangular, or unbalanced, with the aft side of the blade, in a foil design, being much larger than the forward. Up to a certain size (above which the rudder becomes difficult to manage), the unbalanced blade, which was developed during the medieval period, is advantageous for a ship with quarter rudders. The submerged foil-designed blade can equalize to a neutral position from most angles more easily than can a balanced blade, thus increasing the force of the rudder (Mott, 1991: 34 and 41). Until the end of the period under study, when a single rudder was affixed to the sternpost with iron pintles and gudgeons, a pair of steering oars or rudders, called *temones*, were set at the stern on the quarters of both large and small vessels alike, with few exceptions. Steering was accomplished by setting the blades in contrasting positions. Usually these *temones* were rather large and could function as leeboards. Presumably most would have had a tiller to facilitate their control, although this detail is rare in pictorial images of vessels. The manuscript *Fabrica di galere* (1410) defines the proportions of the *temone* for the lateen-rigged ship described in the manuscript: the total length of the *temone* was equal to a third the length of the keel, or 4 *passa*. The length of both the shank and the blade was 2 *passa*, and the width of the blade at its bottom was to be 4 *piede* (Bonino, 1987: 53 and 54). Small craft of the shallows of lagoons and rivers could be managed with oars or punting poles, and could be maneuvered from any area of the boat. Bow sweeps, large oars at the bow, were sometimes

used on sailing vessels to help the bow across the wind while tacking.

According to Mott (1991: 4-7), a system for mounting a steering rudder has three basic requirements. The system must 1) hold the rudder in place at two points, 2) permit the rudder to be moved in a direction parallel to the axis of its loom (in order to control the depth of the blade in the water), and 3) permit its being dismounted. Tackle, to adjust the rudder, could consist of a simple line attached to the blade of the rudder or a more complex system of block and tackle. One common arrangement consisted of two sets of tackle: the rudder hoist, used to raise the rudder, and the rudder pendant, which prevented the rudder from swinging too far. Another arrangement was a line looped around the rudder with both ends leading up to the deck (Mott, 1991: 3 and 76).

The last two requirements for the mount of a steering rudder apply to steering oars and paddles as well. However, simple paddles or oars, the steering devices used on smaller craft, can potentially be hand held, or secured only at one point by means of a thole bight hung on thole pins, or supported on an oarlock, or, mounted through the hull.

At different times, distinct types of mounts were in use, but a much more significant determinate was the size and weight of the rudders, which affected the strength and type of the mount required (Mott, 1991: 4). At any one time, there were doubtless several systems of mounting in common use.

Figure 118 illustrates the wide range of steering devices and mounting systems represented in this sample: different shapes of blades, and varieties of three of the basic mount systems known to have been used during the medieval period. These include the Roman type box mount, the collar mount, and the aft-mounted system. The box mount (Figure 118 H) was formed by adding a crosspiece upon two throughbeams set near the water line. The rudder shaft passed through the box, and was either lashed to the caprail, or passed inboard through the hull. This system confined the rudder firmly; the rudder could not swing up if it hit shallows, and the rudder could break if not fixed adequately above the level of the keel (Mott, 1991: 23). A modified box arrangement (Figure 118 G) added a wooden collar to the box, through which the shaft passed inboard to a second mounting point, a braced mount inboard (Mott, 1991: 57). This modification evolved into the collar mount system (Figure 118 D), commonly used during the medieval period, where the lower mounting point, made of a loop of either wood or iron, eventually replaced the box completely. In another variation of this system, the through hull mount (Figure 118 C), both mounting points were inboard, probably similar in arrangement to the brace mount system

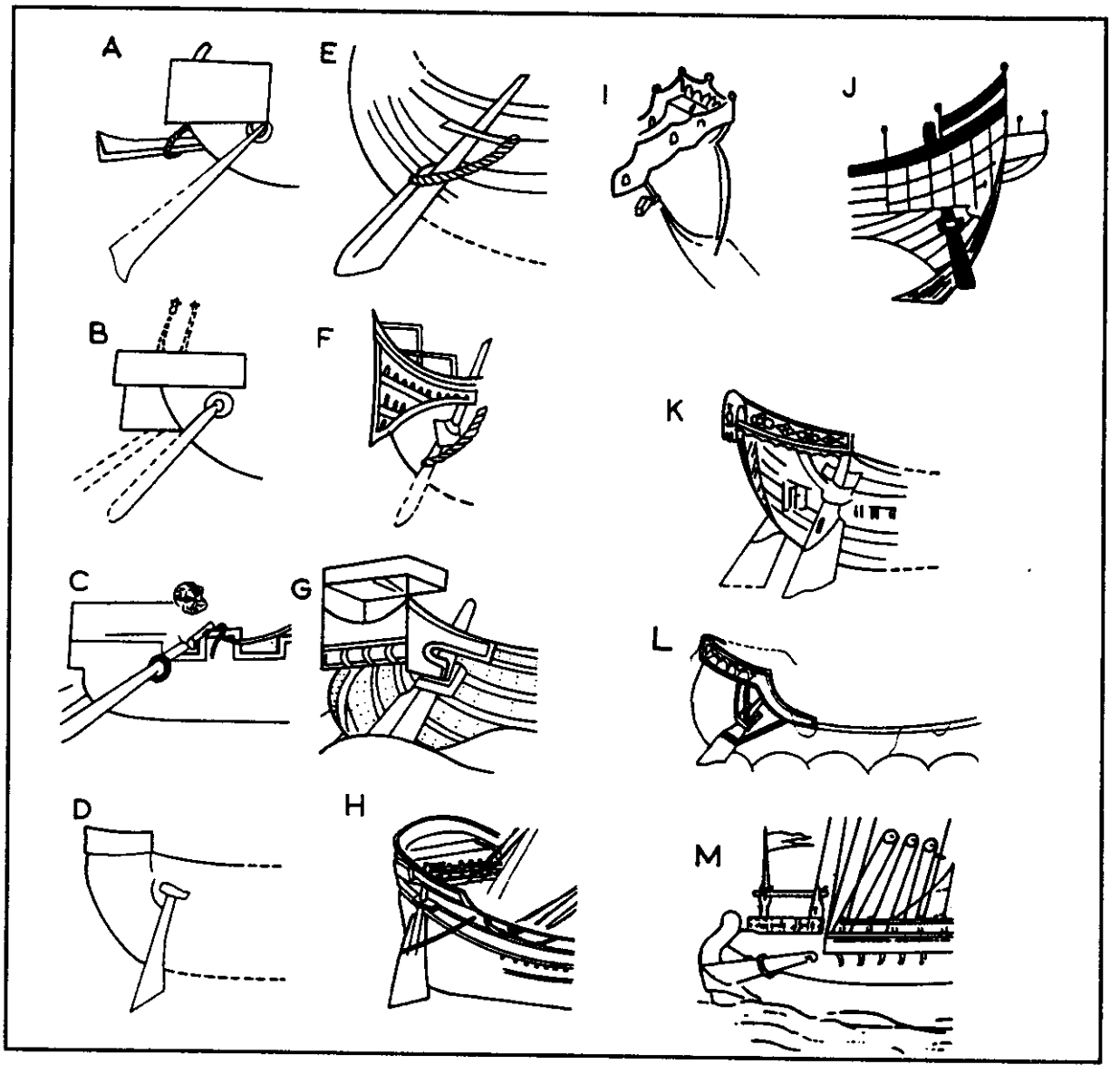



**Figure 118** Examples of rudder mounts represented in the sample (Drawing by Rob Barras).

Figure 118 A) Standard medieval quarter rudder type, with intentionally unbalanced blades of foil design, as depicted in Figure 10 and Figure 12, mounted through a port in the hull and secured further inboard. Note the rudder hoist looped about the port rudder. B) Elliptically-shaped steering oar or quarter rudder represented in Figure 13 and Figure 14, mounted through hull. C) Quarter rudder or steering oar of Figure 15, mounted through hull. D) An example of the *luctatorium* (from Figure 49), a wood or iron ring set where the loom passes inboard, forming the lower mount point, and perhaps the gasket, to seal the port in the hull. Box-type rudder mounts of E) Figure 24 and F) Figure 25, with rudder hoist. G) A combination of the box mount and the through-hull mount secures this unbalanced rudder blade, from Figure 26, and H) from Figure 66. I) An unbalanced quarter rudder blade mounted with the aft mount, from Figure 43. J) An example of the brace mount, from Figure 57; the loom passes through the floor of the sterncastle. K) Detail of Figure 51, depicting the swing mount system. The blades are shown in a reversed position. L) Detail of a swing mount, from Figure 82. M) A swing mount, from Figure 59.

(Mott, 1991: fig. 3.1). This was a sturdy arrangement, and would have allowed the rudder to be raised, but it also would monopolize much hull space. The hole cut through the hull must have been sealed with some sort of gasket or perhaps the *lucatorio* itself fulfilled this function. No more visual examples of this system exist after the 14th century (Mott, 1991: 66). Another variation of the box mount, common on oared ships, utilized the outrigger rather than constructing a separate mount along the sides of the hulls (as in Figure 36). The rudder could be worked from the quarters through the outrigger. Another system exemplified in this sample is the aft-mount system (Figure 118 I), where the rudder shaft attached aft of two strong beams, appropriately spaced diagonally so the rudder shaft could pass between them (Mott, 1991: fig. 3.4). From this the swing mount derived (Figure 118 K), another vast improvement, since it allowed the rudder to pop up instead of breaking should it hit an obstacle.

**Shape of the Steering Apparatus**

The most simple quarter rudders, and all paddles and oars, are balanced, that is, they are symmetrically and elliptically shaped, as seen in Figure 2, Figure 3, Figure 4, Figure 29, Figure 36, Figure 64, Figure 65, Figure 90, and Figure 92. Those small craft with their paddles hung via thole bights on thole pins include Figure 5 (which has a rectangular, balanced blade), Figure 16, Figure 17, and Figure 27. Other small craft with a typically Venetian oarlock include Figure 24, Figure 47, Figure 64, Figure 65, Figure 83, Figure 95, and Figure 96.

Among larger vessels of the sample, there is only one example of an elliptically shaped bow sweep (Figure 29), and numerous examples of asymmetrical, unbalanced rudders (Figure 10, Figure 25, Figure 26, Figure 27, Figure 42, Figure 43, Figure 51, Figure 74, Figure 79, Figure 80, and Figure 81). The foil design is best seen in Figure 10 and Figure 51. A rudder hoist is visible in Figure 10; this is an unusual example in which the line is apparently being used to support the rudder, not just to adjust it.[60]

**Mount Systems**

The sample exemplifies the Roman box mount in Figure 8 A,

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[60] According to Mott, the rudder tackle are usually used just to adjust, not to hold up while under way, except for the type used on swing mounts only, where a loop passes around the rudder with both ends rising up to deck (1991: 76). However, the mound depicted in Figure 10 seems to have this loop, and possibly a rudder hoist as well, and it is a through-hull mount.

Figure 8 C, Figure 24, Figure 27, and Figure 66, while the system frequently used on oared ships, the shaft of the rudder passes through the outrigger, is represented in Figure 8 B and Figure 36.

The modified box mount, supplemented by some sort of braced mount inboard, seems to have had at least two forms. On larger ships, the shaft of the rudder passes inboard through the floor of the quarter-deck, as seen in Figure 26, Figure 39, Figure 40, Figure 56, Figure 57, Figure 74, Figure 77, Figure 78 (Figure 78 is shown under construction: a hook-shaped inner brace is depicted), Figure 79, Figure 80, Figure 81, and Figure 84.

On smaller vessels, representations of the modified box mount show the box to be combined with a triangular shape (e.g., Figure 23 and Figure 25), which was apparently an intrinsic part of the rudder mount system added after hull construction (as illustrated in the construction scene, Figure 91; see discussion, p. 258). The rudder hoist is depicted running from the leading edge of the rudder blade of Figure 23, while on the rudder of Figure 24 and Figure 66, it leads to the trailing edge. Figure 25 is one of the earliest examples Mott located of a fixed mount using a wood collar (Mott, 1991: 57).

The through-hull system, another variety of the collar mount, is illustrated in Figure 10, Figure 12, Figure 13, Figure 14, Figure 15, and Figure 37. In some cases, the collar may form part of the seal, as is the case in Figure 48, Figure 49, and Figure 50.

Figure 43 and possibly Figure 42 are the sole examples in this sample of the aft-mounted system. From this, according to Mott (1991: 64), the swing mount derived. Three late examples in the sample, Figure 51, Figure 59, and Figure 82, show the swing mount system. Figure 59 is also furnished with the pintle and gudgeon mounted stern rudder. For a while during the transition to the pintle and gudgeon system, ships were furnished with both side and stern rudders. This new stern rudder which developed along with the square sail rig in the Mediterranean, was called *alla bavonesca* in Venice (Bonino, 1987: 67).

### Anchors

Several mooring methods used by medieval seafarers are indicated in the cataloged representations in the sample. Figure 24 represents a method characteristic of the shallow lagoons of Venice: the boat is tied off to a piling set in the lagoon with a line attached to either the bow or the stern. The most common mooring method represented or implied, however, is anchoring. Anchors were used when moored at dock or at sea.

A seagoing ship needed several anchor types, including bowers, kedge anchors (small anchors used to keep a ship steady in harbor or to maneuver the ship to and from dock), sheet anchors (a ship's largest, extra heavy anchors), which were thrown only in an emergency (Tinniswood, 1945: 87), as well as some spare anchors. An anchor's particular form or shape, however, does not clearly identify its function (Keith, 1988: 119); thus, unless represented while in use, it is not possible to determine the precise use of an anchor from its depiction.

Fourteen vessels of the catalog show one of their ships' anchors hanging at bow or stern. At least three basic anchor types are exemplified: stone, hook, and grapnel. Only one of the anchors shown is a stone anchor; the remainder are iron anchors. Iron anchors had existed in the Mediterranean at least as early as the 5th century B.C. (Herodotus, description of the Battle of Plataea). The method of forging iron anchors was a long established one that continued until late medieval times: anchors from the 7th-century Yassi Ada and the 11th-century Serçe Limani ships show that anchors were made by forge-welding together many small iron pieces (van Doorninck, 1984: 3-4; van Doorninck and Steffy, in Bass and van Doorninck, 1982: 121-143; Moriarty and Marshal, 1965: 7).

The fourteen anchors in the catalog can be classified into five categories, all illustrated in Figure 119: 1) the round stone, or millstone anchor (Figure 119 A); three varieties of the hook anchor, 2) the V-shaped hook anchor (Figure 119 B and C), 3) the crescent-shaped hook anchor (Figure 119 E, F, G, H, J, K, and N), 4) the cruciform hook anchor (Figure 119 D); and 5) the grapnel anchor (Figure 119 I, L, and M). There is archaeological evidence from the Serçe Limani shipwreck and elsewhere for a fourth variety of hook anchor, the Y-shaped anchor. Although it was probably used widely in the Mediterranean during the 10th and 11th centuries, no examples of it occur in this representational sample. Both the cruciform and Y-shaped hook anchor types apparently disappeared during the Renaissance (Bonino, personal communication, March 5, 1990). Each anchor type represented will be discussed in ascending order of frequency.

**Anchor Types**

**Millstone anchors** (Figure 119 A). A manuscript illumination from the first half of the 14th century illustrating the martyrdom of St. Clement (Figure 47) shows St. Clement being drowned with a stone anchor tied to his neck. The millstone anchor (Figure 119 A), approximately

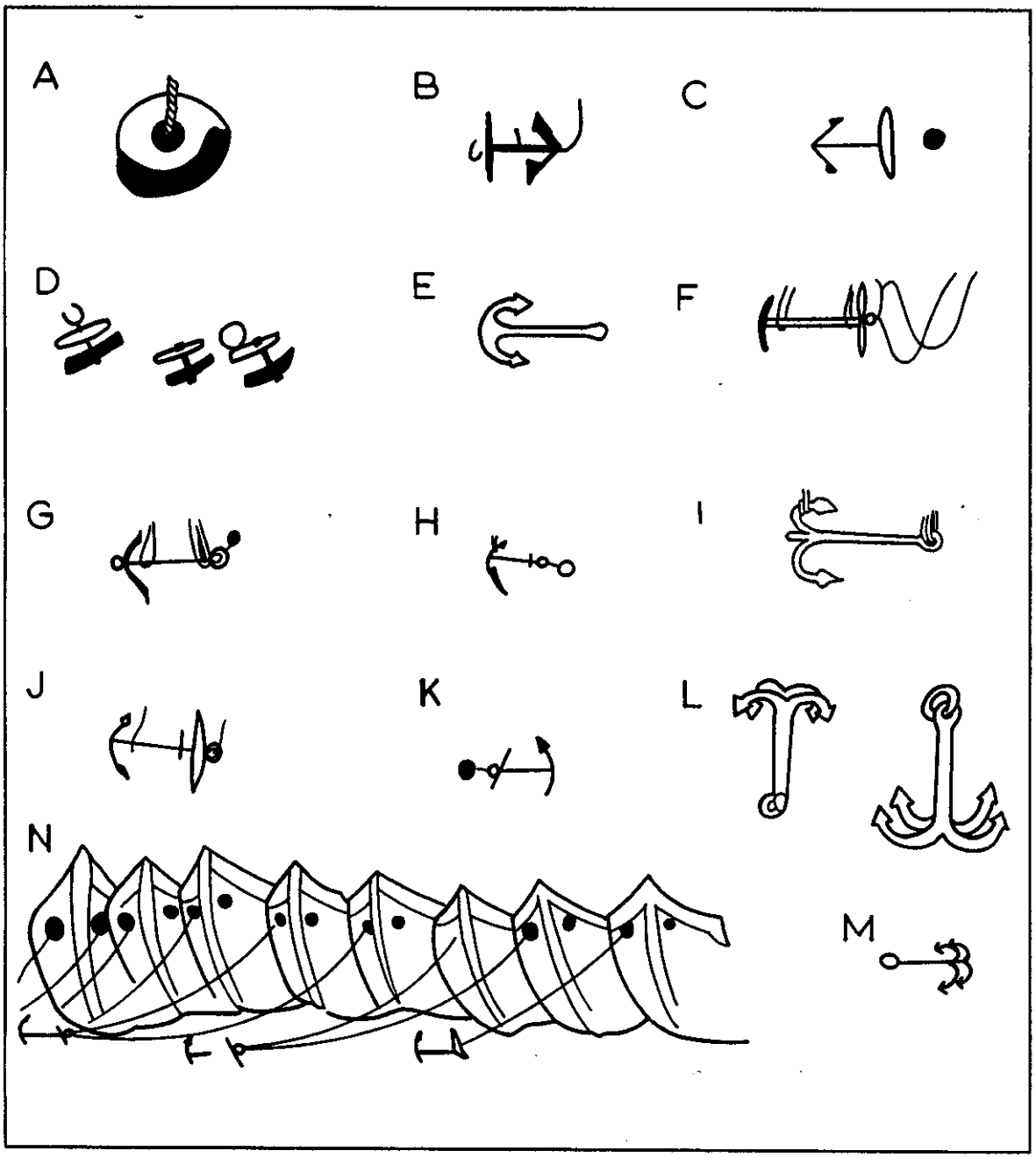



**Figure 119** Examples of anchor types represented in the sample (Drawing by Rob Barras).

A) Millstone anchor of Figure 47 (14th century). B) V-shaped hook anchor of Figure 37 (1255). C) V-shaped hook anchor of Figure 77 (14th century). D) Cruciform or crescent-shaped hook anchors of Figure 15 (12th century). E) Crescent-shaped anchor (after Moll, 1927: Pl. XXII, fig. 2). F) Crescent-shaped anchor of Figure 74 (1345). G) Crescent-shaped anchor of Figure 26 (ca. 1300). H) Crescent-shaped anchor of Figure 42 (14th century). I) Grapnel of Figure 70 J) Crescent-shaped anchor of Figure 81 (14th century). K) Crescent-shaped anchor of Figure 43 (14th century). L) Examples of the grapnel anchor from *Arte de far vasselli*, a copy of *Fabrica di galere* (ca. 1410), a technical treatise on galley making in Österreichische Nationalbibliothek, cod. 6391, fol. 14$^{R}$, and M) from Figure 59 of the *Book* of Zorzi da Modone (1448-1449), and N) Crescent-shaped anchors of Figure 44 (14th century).

twice the size of the saint's head, has a centered hole about one-third the total diameter of the stone. Millstone anchors were used in small craft of the Mediterranean and Northern Europe from as early as the Early Bronze Age to at least the end of the medieval period (Moriarty and Marshal, 1965: 10).

**Cruciform iron anchors** (Figure 119 D). Three hook anchors hung at the bow are depicted on a round ship in Figure 15 (12th century). Although these may be very schematized portrayals of another hook type anchor (either the V- or crescent-shaped), these anchors seem to be of the cruciform variety. If so, they constitute the only examples of this type seen in our sample of representations. The foremost anchor is secured in the bow through the hawse hole; the after two are fastened inboard, with their cables running over the gunwale. The stock of these anchors is depicted as being slightly shorter than the length of the two arms together. The shank is short relative to the stock, at 3/4 the length of the stock instead of equal to it. More reliable proportions for the cruciform anchor are known from one discovered with the 4th-century Cervia boat (Bonino, 1978 A: fig. 9 B; Figure 101). Although its stock was not found, the shank length is more than a third longer than the combined lengths of the arms. The iron shank is circular in section, its copper arms square. The stock was not found. The form of the Cervia anchor is identical to anchors found on the Dramont wreck and the 7th-century ship at Yassi Ada (van Doorninck and Steffy, in Bass and van Doorninck, 1982: 121-143), as well as other representational examples, such as an 8th-century Byzantine relief at Karabagla, and a later Italian example (ca. 1300) at San Eustorgio of Milan (Bonino, 1978 A: 41); it is clear that the type is widely used.

**V-shaped hook iron anchors** (Figure 80, and Figure 119 B and C). Three examples, seen in Figure 37, Figure 77, and Figure 80, illustrate the V-shaped hook anchor, sometimes referred to as a long plan anchor (Moriarty and Marshal, 1965: fig. 10 C). This type, probably derived from Mediterranean iron anchors of the Hellenistic period, which, according to Kapitän, are characterized by a rectangular shank (1984: 43). The type seems to have been gradually phased out of use in the Mediterranean, but appears to have been reintroduced to the region by 1000 (Moriarty and Marshal, 1965: 7).

The anchor in Figure 37 (1255) is hung horizontally at the bow, crown forward. Its flukes seem excessively large. Two 15th-century depictions (Figure 77 and Figure 80), also show a V-shaped hook anchor hung horizontally at the bow, but with the crown swung aft. All three

examples portray a stock fitted at the head of the shank; the stock would have caused the anchor to cant, setting itself into the sand as seen in Figure 44. Use of fixed-stock anchors reflects little concern over space on board the *nave* or the *tarrete*, and probably indicates a trend toward heavier and fewer anchors on larger-capacity ships.

**Crescent-shaped iron anchors** (Figure 119 E, F, G, H, J, K, and N). This type is the most common anchor represented, with a total of seven examples. Some crescent-shaped anchors were apparently stock-less or had removable stocks (Figure 26, Figure 42, and Figure 119 G and H), but most had fixed stocks at the tops of their shanks (Figure 43, Figure 44, and Figure 74 [Figure 119 F, K, and N]). Stocks were either wooden or wood sheathed in iron (Moriarty and Marshal, 1965: 6).

In Figure 43 (Figure 119 K), a crescent-shaped anchor with a fixed stock, the hawser runs from the ring of the anchor through a hawse hole. Figure 119 J, the fixed-stock anchor of the ship depicted in Figure 81 (1318-1358) resembles the anchor in the *Pala Feriale*, Figure 74 (Figure 119 F). In these cases, two lines loop around the shank of the anchor, while a hawser leads inboard from the loop at the top of the shank. In Figure 44 (Figure 119 N), eight vessels are shown in harbor, sharing three or four anchors between them. The shanks lay horizontally upon the top of the sand, and one arm of the anchor is imbedded into the sand. Nine hawsers are visible out of hawse holes of the eight ships. The vessel closest to shore has both port and starboard hawse holes utilized. The first anchor visible moors the fourth and fifth vessels; the second anchors the sixth and seventh vessels; the third, the seventh vessel and the fourth, the eighth vessel. This representation is a valuable example of medieval harbor mooring techniques.

Hanging anchors to be ready at the bow, was apparently the common practice. The method of securing a crescent-shaped anchor with a fixed stock can best be seen in Figure 120, a detail from the late 15th-century painting (ca. 1490) by Carpaccio of the arrival at Colonia of the St. Ursula cycle (housed at the Galleria dell' Accademia). In the background, the bow of a round ship is shown in profile. One hawser, tied through the hawse hole, loops around this ship's anchor shank just below the stock, and another line, secured at the base of the shank just above the attachment of the arms, runs over the gunwale to be affixed inboard. The anchor is thus fixed horizontally in place. On the foreground vessel, viewed from the bow, one cable, running from the port hawse hole, already secures the vessel, perhaps to the dock. Two anchors hang ready at starboard, with their cables secured somewhere inboard, through the hawse hole, or, to port, simply

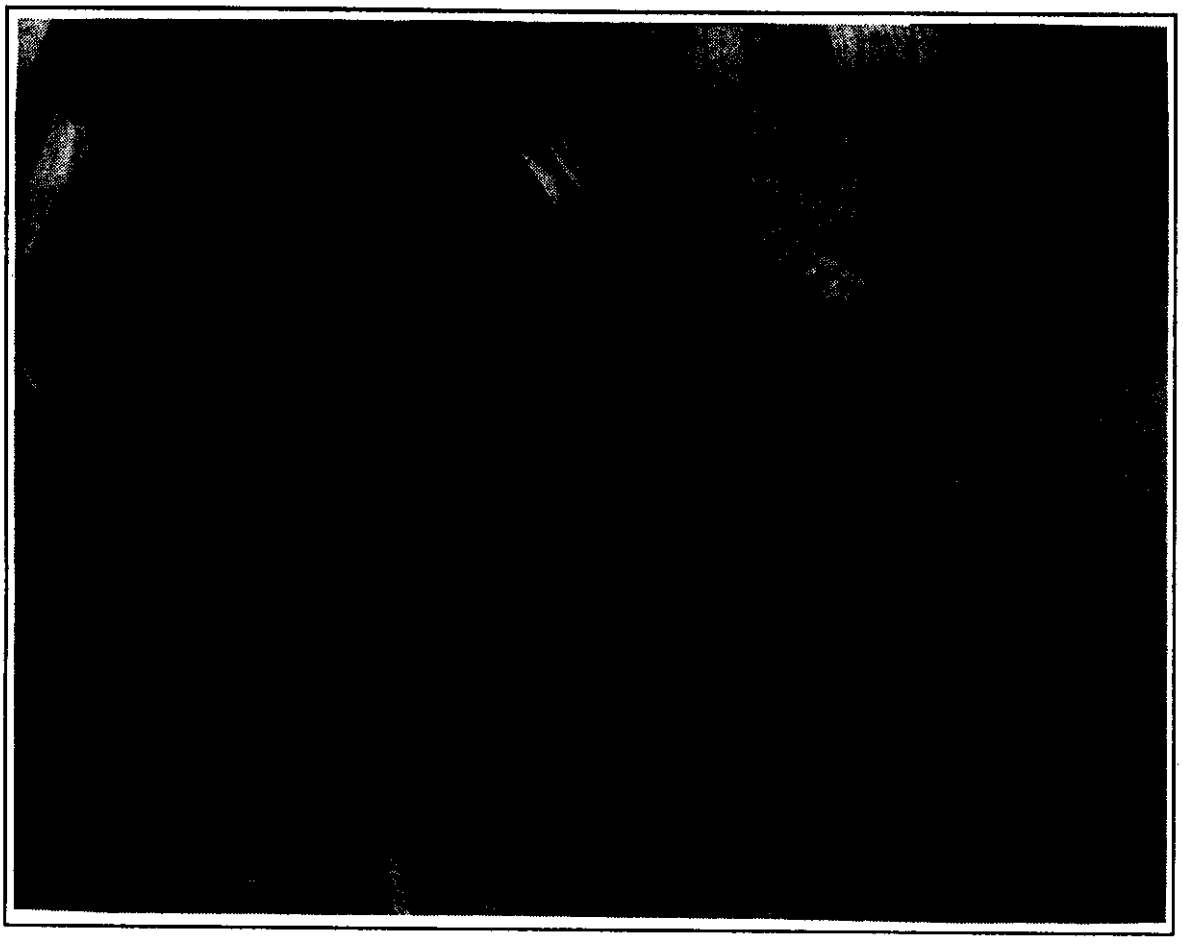


Figure 120 Detail from the late 15th-century painting by Carpaccio of the St. Ursula *vita* cycle: Arrival at Colonia, Galleria dell' Accademia (Courtesy of the Museum).

over the gunwale. Similarly, the stock-less bower anchor in Figure 26 (Figure 119 G) is supported horizontally by two lines, affixed inboard, which pass over the gunwale and loop around both the upper and lower shank. A hawser leads from the ring at the upper end of the shank through the hawse hole inboard. At the crown end of the anchor is another ring; a buoy could be attached to this end to facilitate freeing and hauling the anchor. Ropes hung over the gunwale support the anchor in Figure 42 (Figure 119 H), and a hawser runs from the anchor ring through the hawse hole. A final example of a stock-less hook anchor is seen in a watermark design made in 1376 (Moll, 1927: Pl. XXII, 13 B); it has a very pronounced crescent shape.

**Grapnel iron anchors** (Figures 62, 63 and 119 I, L, and M). The grapnel anchor is characterized by four arms with flukes. A possible early representational example is seen in the ship of Figure 63, a 13th-century fresco recorded by Levi. *Arte de far vasselli*, a copy of a

15th-century manuscript, contains sketches of grapnel anchors on folio $14^R$ (Figure 119 L), and a ship with a grapnel hung horizontally at the bow, crown forward (Figure 59 and Figure 119 M). Other grapnels in the sample include one hung horizontally at the bow, crown aft (Figure 70 and Figure 119 I), and one hung off the bowsprit (Figure 62). Typical grapnel anchors were raised from the 16th-century Lazise galley (Scandurra, 1972: 220, with figs. 16 and 17). A small grapnel with no flukes, probably an anchor for the ship's boat, was found with the 7th-century Byzantine ship at Yassi Ada (van Doorninck and Steffy, in Bass and van Doorninck, 1982: 140). This is perhaps the earliest known example of a grapnel anchor in the Mediterranean, although the type was probably used throughout the Greco-Roman period, and continues to be used today as a sand anchor.

The anchors of this sample provide other information worth discussion. Evidence for the number of anchors normally on board is presented in Appendix III. Next, the most common location and orientation in which anchors are depicted will be remarked on, followed by technical details of the anchors, with a comparison to the results of a similar anchor study made by Tinniswood, and some comments on the hawse hole.

Each anchor representation in our sample shows only one anchor. Based on the evidence of maritime codes and on archaeological evidence, however, it is clear that there were many other anchors on board all ship types; these were either stored on deck or below deck, or on the far side of the ship, positions which would not all be visible in a portrayed view of a ship.

It is evident from these illustrations that an anchor hung horizontally at the bow was a common position for anchors to be hung. In many of the examples with anchors (Figure 26, Figure 42, Figure 43, Figure 74, Figure 77, Figure 80, and Figure 81; Figure 119 G, H, K, F, C, and J), a bower is shown hung horizontally at the bow, with the crown aft. Only two examples (Figure 37 and Figure 59), show the anchor hung horizontally at the bow with the crown forward. In one illustration (Figure 15), three anchors are represented hanging at the bow neither vertically nor horizontally, but with their crowns angled forward. Only one example (Figure 74 and Figure 119 F) shows an anchor hung at the stern, but again, it is hung horizontally, with the crown aft. In another illustration (Figure 44 and Figure 119 N), the anchors are shown actually set, as they would have been in the sand underwater.

Unless some medieval anchors were only weight anchors, rather than the more effective canting anchor, the proper perspective of the stock

in relation to the shank is rarely accomplished in medieval art. As exemplified by Figure 44 and Figure 74, the anchor stock in most depictions is drawn as if it were in the same plane as the arms. Most of these anchors were apparently drawn in a contorted perspective, in attempts by the artist to define both the anchor arms and stock clearly. Presumably the majority of anchors we see depicted with a stock were in fact canting anchors; if so, the stocks would have had to be set perpendicularly to the shank in order for the anchor to cant. As none of the depictions that have anchors show any concern for accurate perspective anywhere else, the artist probably hasn't bothered to indicate any foreshortening, but is giving us a more or less accurate "profile view" of the arms, stock, and shank. If so, the measurements of the arm, shank and stock lengths at least give a rough idea as to the relative size of anchor parts. On this assumption, in the following section, I have measured and compared the anchors of this sample to those a similar study conducted by Tinniswood in 1945; his study was based on a sample of 45 Mediterranean anchor representations.

**Technical details of the anchors represented**

In a study of anchor representations by Tinniswood (1945: 85) he concludes that the average proportions of medieval anchors was as follows.

| Stock : Shank | Shank : Arm | Arm : Fluke |
|---|---|---|
| 1 : 1 | 2 : 1 | 2 : 1 |

The evidence from this study corresponds to Tinniswood's conclusions only partially. 63% of the examples have a stock to shank ratio of 1 : 1; 45% show the shank to arm ratio to be 2 : 1; and 86% reveal an arm to fluke ratio of 2 : 1. The stock to shank ratio also was commonly 2 : 1 in this study, while the shank to arm ratio ranged from 1 : 1, 3 : 1, to 3 : 2, and there were examples of an arm to fluke ratio as great as 4 : 1.

According to Tinniswood (1945: 85), the length of a stock roughly equalled the length of the shank. More than half of the examples in my study support that statement; the stock of some anchors, however, is apparently twice the length of the shank.

The flukes which are recognizable in the representations are what Moriarty and Marshal call the spade or herreshoff type (1965: fig 17). In my study, 86% of the examples corroborate Tinniswood's evidence that the fluke was an equilateral triangle, roughly half as long as the length of an arm.

Tinniswood also states that the length of the shank generally

equaled the length of both arms. This proved to be true in only 45% of the cases in this study, where the shank to arm ratio ranged from 1:1, 2:1, 3:1, to 3:2. A proportional design of 3:1 is said to create the greatest holding power (Moriarty and Marshal, 1965: 7).

Tinniswood's study also states that during the time covered in our survey, the odds were 3:1 that the angle between the arm and the shank was 45 degrees (Tinniswood, 1945: 85). This proved true in only 27% of the cases in our study; instead, the angle ranged from 44 to 89 degrees. Obviously such divergence makes precise conclusions impossible.

**Hawse holes and bitts**

Thirteen figures include a hawse hole at the bow (Figure 26, Figure 28 (1300), Figure 41 [1366], Figure 42, Figure 43, Figure 44, Figure 45, Figure 49, Figure 50 [14 cent.], Figure 63 [13th cent.], Figure 73 [1345], Figure 79, Figure 80, and Figure 81). Once ships became larger, and their anchors so heavy that it was less feasible to heft them overboard, the hawse hole developed (Moll, 1927: 304), and a hawser ran through it into the ship's hold. The San Isidore chapel mosaics (ca. 1300) include the earliest represented examples of hawse holes (Figure 26 and Figure 28).

A few examples, including that in Figure 37, show vertical bitt beams serving to bitt the hawser (Pryor, 1984, no. 3: 277).

The maritime statutes collected by Predelli date to 1227 (Ziani), 1229 (Tiepolo), and 1250 (Zeno). The information given in these codes concerning anchors is tabulated in Appendix III. Ziani's Statutes of 1227 make no mention of anchor requirements, but both Tiepolo and Zeno's Statutes give requirements on vessels from 200 to 1000 *migliaia*. These data reflect a slight increase in the number of anchors, buoys (*indigarios*), and hawsers (*canapos* or *canouos*) required on all vessels in 1250 as compared with 1229. Zeno's Statutes also make a distinction between the *naves* and *tarrete* not made in the earlier Statutes. *Naves*, required to carry more anchors and hawsers than the *tarrete* in 1250, were apparently heavier ships needing additional anchors. In general though, a rather large number of anchors was required. They were, then, obviously still relatively small and light anchors.

It would be helpful to locate the maritime codes from the following century. An increase in anchor weight occurred late in the 13th or early in the 14th century. As the anchors were made heavier, one would expect to see a decrease in the number required by law (van Doorninck, personal communication).

## Further Research

There is an obvious need for additional work in this new research field of maritime images. The results of this study could be compared with the results of similar studies of maritime imagery, such as one recently done by Katerina Delouka for Byzantine ship graffiti from the churches of Aegina, Greece (June, 1990, *Inventaire des graffiti navals des eglises byzantines et post-byzantines*, master's thesis under the direction of M. L. Pressouyre and M. E. Rieth at the University of Paris, U.F.R. D'Archéologie).

A data base needs to be established for all known maritime art, with a standardized format for criteria. Existing index catalogs, such as the Princeton Art Index (copies at the Vatican and Princeton University Libraries) must be consolidated with the published surveys of maritime art, such as those by Moll (1920), Nebbia (1932), and Vocini (1950), and entered into the data base. New surveys must be made and likewise integrated into the data base. A survey of Venetian art after the mid-15th century would be an extremely profitable endeavor, especially since the art is more accurate to detail, and numerous prints of cityscapes and paintings of naval victory scenes exist that incorporate hundreds of ships and boats in merely one image. A survey of the art from the Dalmatian coast, and Venetian colonies throughout the Mediterranean, would likewise be informative. Graffiti that still remain on monuments must be located and documented. They are especially frequent on church portals and icons, and in castle prisons. Their documentation now is of the utmost importance, since otherwise evidence will be lost. Greek churches, for example, are continually whitewashed, and castles and fortifications are falling into ruin.

Further research may result in a more complete understanding of Mediterranean seafaring and ship construction, as well as provide a ready source for comparison when new shipwrecks do come to light.

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# APPENDICES

## APPENDIX I

### ENGLISH AND LATIN/VENETIAN NAUTICAL GLOSSARY[62]

| | |
|---|---|
| **ABAFT** | Further aft of. |
| ***AMANTUS*** | Tie for the yard. |
| ***ANTENNAE*** | The yard. |
| ***ARBOR DE MEDIO*** | Middle mast. |
| ***ARBOR DE PRORA*** | Foremast, mast at bow (sometimes known as *artimonum* or *artimon*), which was taller than the other/s and raked forward. |
| **ASTERN** | Behind the ship. |
| ***ANCHUS*** | Parrel tackle. |
| **APRON** | An internal member rigidly attached to the stem to increase its size and strength. Also a point of attachment for planking. |
| ***ARTEMON*** | A sail used on the foremast or *arbor de prora*; for medieval lateen-rigged ships, the term is more correctly foresail. |
| **BATTEN** | A long strip of wood bent around molds or frames of a ship's hull to determine hull shape or fairness of curvature. |
| **BELAY** | To secure a rope by giving it several cross turns alternately round each end of a cleat, pin, etc. |
| ***BELLATORIUM/BALLADOR*** | Fighting gallery behind the *paradisi* at the stern of some Crusader transport ships, perhaps in part to provide protection for the vital, but vulnerable quarter rudders. |
| **BITT/BOLLARD** | Strong post (usually set in pairs) which projected above the deck of the ship, used for belaying cables, lines, etc. A frame composed of two upright pieces of timber, called the pins, and a cross piece fastened horizontally on top of them. Bowline and brace bitts were set near the bowlines and the masts; riding bitts, the largest bitts in a ship, were those for the anchor cable. |
| **BLADE** | The flat, immersed, turning portion of a steering oar or quarter rudder. |
| **BLOCKS** | One or more freely rotating, grooved pulleys, set in a separate housing, about which ropes passed to form a hoisting or hauling tackle. |
| **BOWLINE** | The tack, or line attached to the heel, or forward, lower corner of a fore-and-aft sail. |
| **BRAILS** | Ropes to truss up square sail. |
| **BULWARK** | Solid structure or stantions with railing, which extended above level of deck to protect persons or objects on board. |
| ***CALCET*** | Heavy piece of timber scarfed to the masthead which had two lateral pulleys inserted in it side to side and by means of which lateen yards were hauled. May have also been the structure to which the crow's-nest was attached. |
| **CAMBERED** | Having a slight upward arch or crown. |
| ***CANDELA/AE*** | Shroud/s. |
| **CANT TIMBER** | A framing member which was mounted obliquely so that its cross-section would remain more nearly rectangular along the in-curving ends of the vessel. |
| ***CARES*** | Heal, or lower section, of a two-piece yard. |
| **CATHEAD** | Beam, projecting from hull, used to raise anchor. |
| **CAULK** | To insert oakum or other material between planks to make watertight by filling the seams. |
| **CLEW** | The after, lower corner of a fore-and-aft sail, controlled by the sheet. |
| ***COFFA/CHEBA*** | Crow's-nest. |
| **CROW'S-NEST** | *Cheba*. Platform, basket, or box at the top of a mast where a look-out can be posted. |
| **DOUBLE-ENDED** | A hull which is nearly symmetrical about the midship transverse plane. |
| ***DRIZZA*** | Halyard. |
| **FALL** | The rope that connects the blocks of a tackle. The fall sometimes implies only the loose part which is pulled upon to produce the desired effect. |
| **FLOOR TIMBER** | Any framing timber which crossed the centerline of the keel and whose arms extended far enough to traverse one or more planking strakes on each side of the keel. |

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[62] Based on Guglielmotti, Alberto, 1899, Vocabulario marino militare; Corazzini, F., 1900, Vocabulario nautico Italiano; Bathe, Basil W., 1978, The visual encyclopedia of nautical terms under sail; Gill, Claude S., 1982, Steel's elements of mastmaking, sailmaking and rigging; Pryor, John H., 1984, The Naval Architecture of Crusader Transport Ships: A Reconstruction of some Archetypes for Round-hulled Sailing Ships, Mariner's Mirror 70: figures 7, 9, and 13; and Steffy, J. Richard (personal communication, and class handout from "Ship Reconstruction," spring, 1986).

| | |
|---|---|
| **FLUSH-LAID** | Planking in which adjoining strakes are abutted, edge-joined, and do not overlap. |
| **FOREMAST** | *Arbor de prora, artimon or artimonum*, the mast nearest the bow on vessels with more than one mast. On a lateen-rigged ship, it is generally the tallest mast, and has a strong forward rake. |
| **FRAMES** | Single or composite members (floors, futtocks, half-frames, and top-timbers) attached to the inner side of the hull planking mounted more or less perpendicularly to the keel, whose function was that of strengthening the hull and maintaining its shape. |
| **FUTTOCK** | A timber which extends the line of a floor or half-frame. |
| **GARBOARD** | The lowest outer hull strake, with its lower or inboard edge attached to the keel. |
| **GROMMET** | Strands of rope in the form of a ring, used to secure sail to yard, oars to pins on the gunwale, etc. |
| **GUDGEON** | A socket attached to the stern frame of a vessel, for holding a pintle of a rudder. |
| **GUNWALE** | Upper edge of the hull of an open boat. |
| **HALYARD** | Ropes or tackle employed to hoist or lower yards. On lateen rigged ships, it served a double function in that it led aft, acting as a backstay. |
| **HALF-FRAME** | A framing member which commenced at or near the keel and spanned both the bottom and part of the side of a vessel. Half-frames were single timbers used in lieu of floor timbers and futtocks and were normally employed in pairs. |
| **HAWSE HOLE** | Hole in side of hull at bow for anchor cable or mooring line. |
| **HAWSER** | Anchor cable. |
| **KEEL** | The lowest longitudinal member of a hull. |
| **KEELSON** | An inner keel mounted atop the floor timbers, directly above the keel, whose function was to stiffen the bottom structure. |
| **LATEEN RIG** | The arrangement in which a three-cornered sail is attached to a yard which obliquely crosses a low, forward-raking mast. |
| **LOOM** | The shaft or inboard part of the oar or rudder; a pole-like supporting axis for the blade. |
| ***LUCTATORIUM*** | Collar through which the loom of the rudder passed which attached the rudder to the hull. |
| **MAST CRUTCH** | The forked pole, or cradle, on which an unstepped mast was supported. |
| **MAST STEP** | Fitting used to locate the heel of the mast. |
| **MIZZEN** | On a lateen rig, the mast directly behind the main mast. |
| **MORTISE-AND-TENON JOINT** | A union of planks or timbers in which a projecting piece, called a tenon, was fitted into one or more corresponding mortises. |
| ***MULGARANUS*** | Heavy rope attached to base of yard which controlled its fore and aft movement, and was rove through a block on the deck. Could be taken in to peak the yard either while sailing to obtain maximum efficiency, or when tacking. |
| ***OSTA*** | Vang. |
| ***ORSIA*** | Bow or tack lines. |
| **PARREL** | A sliding ring or collar of rope or wood that confined a yard to the mast but allowed its vertical movement; tackle which fit the yard to the mast and reduced friction so that it could be hoisted or lowered with facility. In the medieval period, a truss, or parrel trucks, was used. |
| **PARREL TACKLE** | Line which tightened the yard to the mast at the parrel, and belayed at the bulwarks. |
| **PARREL TRUCKS** | Round balls of wood with a hole through the middle in which a rope was reeved, to form low-friction parrel. |
| ***PARANCHUS*** | Top tackle. |
| **PEAK** | The upper corner of a fore-and-aft sail, controlled by the vang. |
| ***PECIAE ANTENNARIUM*** | Pieces of the yard. |
| **PEG** | A tapered wooden pin which was driven into a pre-drilled hole to securely fasten two members or lock a joint. |
| **PENDANT** | Free line which led to a block; large, but short, ropes which went over the mast-heads, to which were hooked the main and fore tackles, and served to transmit the effort of their tackles to some other object. |
| ***PENNA*** | Upper section of the yard. |
| **PINTLE** | A pin or bolt, especially one on which something turns, as the gudgeon of a hinge. |
| ***POZIA*** | Sheet (Hocker, 1987: 367). |
| **PURCHASE** | A lever, pulley or other device which provided mechanical advantage for moving a heavy object. |
| **QUARTER RUDDER** | A steering device which was securely attached to the side of the stern of a vessel. The flat immersed portion is called the BLADE. It was affixed to the STOCK or LOOM, a pole-like vertical member which pivoted within a collar or other supporting fixture attached to the hull. A TILLER, the handle by which the rudder was turned, was perpendicularly attached to the upper end of the stock. In all cases, quarter rudders were solely designed for steering purposes and required secure attachment to the hull. |
| **RABBET** | Groove cut into keel (or other member) for purpose of seating planks. |

**RIDING BITT** A heavy bitt for making fast the cable of a dropped anchor.

**ROCKER** Fore-and-aft curvature of the keel of the bottom of vessel.

**ROOM-AND-SPACE** Average of the distances between frame centerlines throughout the hull. Average frame spacing.

**ROBANDS** Small lengths of line passed through at the head of a sail to attach it to the yard. Used to fasten the head of the sail to the yard. Also known as rovings.

**RUNNER** A line which goes over a pulley and then to a block, a single rope, connected with a tackle, which transmits its effort the same as if the tackle was the whole length.

**SCARF** An overlapping longitudinal joint used to connect two timbers or planks.

***SENALI*** Shrouds.

**SHEAVE** Pulley for hoisting or hauling.

**SHEER** The fore-and-aft curve of the hull at the main deck or bulwarks. The longitudinal sweep of the caprail or the top of the hull.

**SHEER STRAKE** The top strake of planking at the level of the main or upper deck of a vessel.

**SHEET** *Pozia*. Line which controlled the clew of the sail, to retain clew in any direction.

**SHELL CONSTRUCTION** The process by which all or part of the outer hull planking was erected before any frames were attached to it. In shell constructed hulls, outer hull planking was self-supporting and formed the primary structure; the framework fastened to it formed the secondary, or stiffening, structure.

**SHROUDS** Lines which led from the mast head to the sides of the vessel, set up with deadeyes and lanyards, which supported the mast athwartships. The shroud assembly included the pendant and block runner through which a runner tie was rove and tightened by means of a dead eye at the gunwale. Medieval terms believed to identify various parts of the shroud assembly: *senali, chinali, poppeso, prodón a prodesso, quarnale* (Pryor, 1984).

**SKELETAL CONSTRUCTION** The process by which hulls were constructed by first erecting frames and then attaching the outer skin of planking to them.

***SPERON*** Boarding platform.

**STANTIONS** Wooden pillars used to support awnings and other things.

**STAYS** Fore-and-aft mast support lines: *suste*. Ropes which led from the mast head forward and aft to support the mast.

**STEERING OAR** An oar used to steer a vessel, consisting of the BLADE, or turning surface; the LOOM, a pole-like supporting axis for the blade; and sometimes a TILLER, or turning arm, attached to the upper end of the loom. Steering oars could be used singly or in multiple, along the sides or astern of the vessel. While steering oars might have been collared or otherwise attached to the hull in some cases, they were lighter and much more portable than quarter rudders.

**STEM** The heavy timber extending forward from the keel and forming the upright post to which the two sides of the bow were attached.

**STERNPOST** The heavy timber extending aft and upward from the keel, to which the two sides of the stern were attached.

**STOPS** Bindings which attached the furled sail to the yard.

**STRAKE** A continuous row of planking, either made up of one piece, or several pieces scarfed together, extending from bow to stern.

**SUSTE** Stays.

**TACK** The line to the clew, the forward, lower corner of a fore-and-aft sail, to maneuver side-to-side movement of the base of the yard. The forward, lower corner of a fore-and aft sail.

**THROUGH-BEAM** An athwartships beam which penetrated the outer hull planking.

**THOLE** A pin which projected upwards at the sheer level to provide a pivot for an oar.

**TILLER** Handle, attached perpendicularly to the loom, by which the rudder was turned.

**TOP-TIMBER** Timber which formed the uppermost component of frame which extended to the rail cap or sheer.

**TRAGENT** *Trigànte*. Heavy transverse beam at upper end of sternpost, which provided support for cabins in the sterncastle, on a wing transom stern.

**TRANSOM** One of the beams fastened across the sternpost, which strengthened the stern and gave it a fuller shape. The deck transom held the ends of the lower deck planking; above it was the highest transom, the wing transom. The curve described by the transoms as they narrow in and down toward the keel is called the flight of the transom.

***TRIGÀNTE*** Tragent.

***TROCA/TROZZA*** Truss which held the yard to the mast; fitted with parrel trucks to prevent wearing and to reduce friction.

**TRUSS** A device that supported a standing yard. A pivot allowed the yard to swing horizontally when braced.

**VANG** The *osta*, a sail shaping line, which ran to near the top of the *penna* of the yard; permitted trimming of the peak.

| | |
|---|---|
| **WALE** | A heavy piece of outer planking strategically placed to gird the upper part of the hull. The wales acted as bands which bound the upper part of the hull together. |
| **WEDGES** | Fortification at girth of mast which immobilize the partner and help set the mast vertically. |
| **WHIP** | A small single tackle, formed by connecting the fall to a single block or with two blocks (one fixed, one movable), used to hoist things. |
| **WOOLDINGS** | Windings of several close turns of rope in a tight manner around masts and yards that are made of several united pieces to strengthen and confine the same together. Wooldings girded the mast at fixed intervals. |
| **YARD** | A long spar, supported more or less at its center, to which the head of the sail is bent. |

# APPENDIX II

## MUSEUMS, LIBRARIES AND CHURCH SITES SURVEYED

The following museums, libraries and churches were inventoried for possible maritime images. Ship or boat images pre-dating 1450 were located in the sites marked with an asterisk, and images from these sites have been included in the catalog unless otherwise indicated.

### Museums Surveyed

The exhibited material of these museums of Venice was completely surveyed, however, collections in storage were not.

Archaeological Museum
Civico Museo Correr *
Franchetti Gallery at the Ca' d'Oro
Gallerie dell'Accademia, Sopraintendenza ai Monumenti *
Gallerie della Fondazione Querini-Stampalia
Museo dell'Estuario, Torcello
Museo Diocesano di Arte Sacra
Museo Dipinti Sacri Bizantini *
Museo di Seminario Patriarcale
Museo Fortuny
Museo Marciano *
Museo Storico Navale *
Museo Vetrario di Murano
Palazzo Ducale
Scuola di San Giorgio degli Schiavoni
Scuola Grande di San Rocco — Unable to visit; under restoration.

* Three ship images in Byzantine icons; not permitted to photograph.

OTHER CITIES:

Aquileia
Archaeological Museum

Ravenna
Museo Arcivescovile
Museo Nazionale

Padova
Museo Civico

### Libraries Consulted

The library collections containing medieval Venetian manuscript material offer an almost indefatigable source of maritime images, and this study has only skimmed the surface of this source of data. These libraries were utilized:

Biblioteca della Seminario Patriarchale *
Biblioteca del Civico Museo Correr *
Biblioteca della Fondazione Giorgio Cini
Biblioteca della Fondazione Querini-Stampalia *
Biblioteca Museo Storico Navale *
Biblioteca Nazionale Marciana *
Archivio di Stato, Campo dei Frari *
Bodleian Library, Oxford University *
Art Index, Princeton University *
Boston Public Library
Texas A & M University Evans Library
University of Texas at Austin Perry-Castañeda Library

## Churches Inventoried

This list of churches in Venice was the initial basis for selection for on-site research. Promising targets included all the medieval churches of Venice; unless otherwise indicated, these were thoroughly surveyed on site. Churches built after the 15th century were not all surveyed on site, since it is unlikely much medieval art exists in them. Dates and information on status is based on Lorenzetti (1982) and author's research at the site in 1989.

| Name | Built | Status |
|---|---|---|
| Agnese | 12-13th cent. | Rebuilt. Defunct, 1810. No medieval naval art found. |
| Alvise | 1388 | Closed; unable to view interior. A cartoon for St. Mark's translatio by Vecchia exists on right wall; likely contains a ship image. |
| Andrea, Chioggia | 13th cent. | Rebuilt; no medieval naval art found. |
| Andrea della Zirada * | 1329 | Medieval naval art found on facade. Unable to visit interior; privately owned and not open to the public. |
| Angelo Michele | Early church | Demolished. |
| Angelo Raffaele | 7th cent. | Early church demolished; present building 1735 |
| Anna | 1634 | |
| Antonin | 4th cent. | Rebuilt in 17th cent. Unable to visit; not open to the public. |
| Antonio | | Deconsecrated; deprived of all art work. |
| Appollinare | 11th cent. | Restored. |
| Apollonia | 14th cent. | No medieval naval art found. |
| Apostoli | Early church | Frequently restored. |
| Barnaba | 18th cent. | |
| Bartolomeo | 9th cent. | Unable to visit; not open to the public. |
| Basso | Early church | No medieval naval art found. |
| Benedetto | 11th cent. | Rebuilt in 17th cent. Unable to visit interior. |
| Biagio | Early church | Rebuilt in 18th cent.; no medieval naval art found. |
| Bonaventura | | No medieval naval art found. |
| Canciano | Very early | Rebuilt in 18th cent.; Unable to visit. |
| Cappuccine | 1623 | |
| Cassiano | 10th cent. | Rebuilt continually. Unable to visit. |
| Caterina | pre-13th cent. | Rebuilt in 18th cent. Unable to visit interior; under restoration. |
| Caterina, Mazzorbo | 14th cent. | Unable to visit. |
| Chiara | | Demolished. |
| Cipriano, Murano | 1108 | Demolished. |
| Clemente | 17th cent. | |
| Cosma, Giudecca | pre-15th cent. | Deconsecrated; not open to the public. |
| Croce, Giudecca | Early church | Demolished; totally rebuilt. |
| Croce degli Armeni | 17th cent. | |
| Daniele | 5th cent. | Demolished. |
| Domenica | | Demolished. |
| Domenico, Chioggia | 1200 | Rebuilt; no medieval naval art found. |
| Elena | 13th cent. | Rebuilt in 1435. Had many treasures removed in 1807; no medieval naval art found. |
| Elisabetta | 16th cent. | |
| Erasmo | | |
| Eufemia, Giudecca | 9th cent. | 18th cent. restoration. Rebuilt; no medieval naval art found. |
| Eustachio (Stae) | 1710 | No medieval naval art found. |
| Fantin | 1507 | |
| Felice | 10th cent. | Totally rebuilt in 1531. |
| Filippo e Giacomo | Early church | Demolished. |
| Fosca | 1011 | Rebuilt in 1679 and 1733. |
| Fosca, Torcello | 639 | Altered in 864, rebuilt in 1008. |
| Francesco del Deserto | 15th cent. | |
| Francesco di Paola | 16th cent. | |
| Francesco della Vigna | 1534 | No medieval naval art found. |
| Gallo | 976-978 | Altered in 1703. |
| Geminiano | Early church. | Lost. |

| | | |
|---|---|---|
| Geremia | 1753-60. | |
| Giacomo dell'Orio | 9th cent. | Reconstructed in 13th cent., altered in 1532; no medieval naval art found. |
| Giacomo in Palude, island | | Unable to visit. |
| Giacomo di Rialto | 5th cent. | Rebuilt and restored; no medieval naval art found. |
| Giobbe | 1378 | Enlarged in 15th cent.; no medieval naval art found. |
| George's | 1892 | Previous chapel, San Vio, demolished. |
| Giorgio dei Greci | 1539 | No medieval naval art found. |
| Giorgio Maggiore | 10th cent. | Rebuilt in 1566; no medieval naval art found. |
| Giov. in Bragora | 8th cent. | Restored in 9th and 12th cent., rebuilt in 1475, again modified in 1728; no medieval naval art found. |
| Giov. Crisostomo | 1497-1504 | |
| Giov. dei Cavalieri di Marta, dei Furiani or del Tempio | | |
| | 1451 | No medieval naval art found. |
| Giov. Elemosinario | Pre-dates 1051 | Totally destroyed by fire in 1513, rebuilt in 1527-9. Closed for restoration. |
| Giov. Evangelista | 15th cent. | Restored, 17-19th cent. No medieval naval art found. |
| Giov. Laterano | | Partially demolished in 1810; no medieval naval art found. |
| Giov. Nuovo | Pre-dates 10th cent. | |
| | | Completely rebuilt in 1762. Closed. |
| Giov. e Paolo | 1246 | Rebuilt in 1333 and restored in 1921-6; no medieval naval art found. |
| Giuseppe di Castello | | No medieval naval art found. |
| Giustina | | Closed in 1810. |
| Gregorio | 806 | Defunct, 1775. Stripped of all art in 1806. |
| Lazzaro dei Mendicanti | 1601-31 | No medieval naval art found. |
| Lio | Pre-dates 11th cent. | |
| | | Renovated in 18th cent., and much restored in 1783; no medieval naval art found. |
| Lorenzo | 6th cent. | Rebuilt numerous times; completely stripped of art; no medieval naval art found. |
| Luca | | Altered in 16-17th cent., rebuilt in 18th cent.; no medieval naval art found. |
| Lucia | | Defunct. |
| Maddalena | 18th cent. | |
| Madonna dell'Orto (Cristoforo) | | |
| | mid 14th cent. | Rebuilt in 15th cent.; no medieval naval art found. |
| Marciliano (Marziale) | 12th cent. | Rebuilt in 17th cent.; no medieval naval art found. |
| Marco * | 832 | Medieval naval art found. |
| Teodoro (Marco) | | |
| Marcuola | 1728-36 | |
| Margherita | ancient | Defunct; now used as cinema. |
| Maria degli Angeli, Murano | 12th cent. | Rebuilt in 16th cent. Locked; unable to view interior. |
| Maria Assunta, Torcello | 639 | Radically reconstructed in 863 and 1008. Expanded in 11th cent. No medieval naval art found. |
| Maria Assunta (Gesuiti) | | Rebuilt in 1714-29; no medieval naval art found. |
| Maria della Carità | | Defunct; now part of *Accademia* |
| Maria del Carmelo | Pre-dates 14th cent. | |
| | | Remodeled in 9th, 11th and 12th cent.; no medieval naval art found. |
| Maria Celeste | | Demolished. |
| Maria dei Derelitti | | Rebuilt in 1674; no medieval naval art found. |
| Maria e Donato, Murano | 7th cent. | Restored in 9th cent., rebuilt in 12th cent.; no medieval naval art found. |
| Maria della Fava | 1711 | |
| Maria Formosa | 7th cent. | Rebuilt in 11th cent. and again in 1492, restored after 1916; no medieval naval art found. |
| Maria del Giglio | end 15th cent. | No medieval naval art found. |
| Maria Glorioso dei Frari | | |
| | 1250 | Expanded in 1340, early church demolished in early 15th cent. rebuilt by 1443; no medieval naval art found. |
| Maria Maggiore | 15th cent. | Defunct; stripped of all art. Now a prison. |
| Maria Mater Domini | 1502-40 | |
| Maria dei Miracoli | 1481-9 | |
| Maria della Misericordie | 10th cent. | Stripped of all art in 19th cent. |
| Maria del Navicella | | No medieval naval art found. |

| | | |
|---|---|---|
| Maria di Nazareth (degli Scalzi) | 1660 | |
| Maria delle Pentienti | 17th cent. | |
| Maria del Pianto | 1647-59 | Abandoned and closed. |
| Maria della Presentazione | 18th cent. | |
| Maria del Rosario | 1668 | |
| Maria della Salute | 1631-81 | No medieval naval art found. |
| Maria dei Servi | 14th cent. | Demolished in 1862. |
| Maria della Visitazione | Beginning of 15th cent. | Rebuilt 1493-1524. Now used by orphanage. |
| Maria della Pietà | 15th cent. | Rebuilt in 1745. |
| Marina | Ancient | Destroyed in 1820. |
| Martino, Chioggia | Ancient | Rebuilt in 1380. Now used as a storehouse. |
| Martino | 593 | Rebuilt in 1540; no medieval naval art found. |
| Marta | Ancient | Now a railway warehouse. |
| Maurizio | Ancient | Rebuilt in 1590. Demolished and totally rebuilt in 1806; no medieval naval art found. |
| Michele (island) | 10th cent. | Suppressed in 19th cent.; now again in use as cemetery church. No early graveyard monuments remain in cemetery. |
| Moisé | 8th cent. | Rebuilt in 10th cent., and again in 1632. No medieval naval art found. |
| Nicolò al Lido | 1043 | Rebuilt in 16th cent.; no medieval naval art found. |
| Nicolò da Bari (ex) | Ancient | Destroyed by Napoleon for public park. |
| Nicolò dei Mendicoli | 7th cent. | Rebuilt and altered various times; no medieval naval art found. |
| Nicolò da Tolentino | 1528 | No medieval naval art found. |
| Nome di Gesù | 1815-34 | |
| Ognissanti | Early 16th cent. | |
| Pantalon | 13th cent. | Rebuilt in 17th cent.; no medieval naval art found. |
| Pietro di Castello | 7th cent. | Completely rebuilt in 1696. Damaged in 1st World War. No medieval naval art found. |
| Pietro Martire, Murano | 1348 | Almost completely rebuilt after 1474 fire; no medieval naval art found. |
| Pietro in Volta, Pellestrina | 17th cent. | |
| Polo | 9th cent. | Radically altered in 1804; no medieval naval art found. |
| Rocco | 1489 | Almost entirely rebuilt in 1725; no medieval naval art found. |
| Salvatore | 7th cent. | Rebuilt in 12th cent. and again in 1507 and 1534; no medieval naval art found. |
| Samuele Profeta | 11th cent. | Much rebuilt in 1685. |
| Sebastiano | | Present church 1505-45; no medieval naval art found. |
| Servolo, island | 8th cent. | Present church 1734-59. |
| Severo | | Demolished. |
| Silvestro | 9th cent. | Stripped of art and entirely rebuilt in 19th cent. |
| Simeone Grande, Profeta | 10th cent. | Many modifications; no medieval naval art found. |
| Simeone Piccolo | 1718-23 | |
| Soccorso | 16th cent. | Now part of girl's school. |
| Sofia | | No medieval naval art found. |
| Spirito, island | | Destroyed in 1656. |
| Spirito Santo | 1483 | Stripped of art in 1806. Defunct. |
| Stefano | 13th cent. | Rebuilt in 14th cent., altered again in 15th cent.; no medieval naval art found. |
| Teresa | 17th cent. | |
| Tomà | 1652 | Closed for restoration. |
| Trovaso | Ancient | Rebuilt in 1028, destroyed by fire in 1105. Soon rebuilt. This structure fell down in 1583, and was immediately rebuilt again. No medieval naval art found. |
| Vio (Vito e Modesto) | 13th cent. | Demolished. |
| Vitale | 11th cent. | Rebuilt in 17th-18th cent. Defunct; now used for exhibitions. |
| Zaccaria | 9th cent. | Altered in 10-11th cent., and rebuilt in 1444-1515; no medieval naval art found. |
| Zan Degolà | 1007 | Modified and altered many times. Defunct, 1818. Closed; unable to view interior. |
| Zitelle, Giudecca | | |
| Zulian | Ancient | Rebuilt in 14th cent. and again in 1553; no medieval naval art found. |

OTHER CITIES:

| | | |
|---|---|---|
| **Aquileia** | | |
| Aquileia Cathedral * | 313 | Early Christian naval art found. |
| **Bologna** | | |
| Petronio * | 1390 | Not surveyed at site; medieval art located through published material. |
| **Bolzano** | | |
| Domenico * | 14-15th cent. | Medieval art located through published material. |
| **Faenze** | | |
| Imola of Faenze * | | Not surveyed at site; medieval art located through published material. |
| **Lucignano** | | |
| Misericordia, * | | Not surveyed at site; medieval art located through published material. |
| **Padova** | | |
| Antonio | 1232 | No medieval naval art found. |
| Baptistry of Duomo * | 13th cent. | Medieval naval art found. |
| Duomo | | Reconstructed in 1552; no medieval naval art found. |
| Sofia | 9th cent. | Rebuilt in 11-12th cent.; no medieval naval art found. |
| **Ravenna** | | |
| Apollinare Nuovo * | 504 | Medieval naval art found. |
| Apollinare in Classe | 535-38 | No medieval naval art found. |
| Battistero Neoniano | 5th cent. | No medieval naval art found. |
| Galla Placidia | 5th cent. | No medieval naval art found. |
| Giovanni Evangelista * | 5th cent. | Medieval naval art found. |
| **Toledo** | | |
| Toledo Cathedral * | Not surveyed at site; medieval art located through published material. | |
| **Verona** | | |
| Anastasia * | 1290-1323 | Not surveyed at site; medieval art located through published material. |
| **Zara** | | |
| Simeone * | | Not surveyed at site; medieval art located through published material. |

# APPENDIX III

## ANCHOR REQUIREMENTS IN 13TH-CENTURY MARITIME CODES[63]

Year: A.D. 1229. Statutes of Doge Jacopo Tiepolo, June 1, 1229, (Predelli and Sacerdoti, 1903: 54-57; [A: 8-16]).

| Tonnage | anchors | buoys | hawsers | |
|---|---|---|---|---|
| | | | new | good condition |
| 200-299 | 6 | 6 | 6 | 5 |
| 300-399 | 10 | 10 | 8 | 12 |
| 400-499 | 12 | 12 | 11 | 13 |
| 500-599 | 14 | 14 | 13 | 15 |
| 600-699 | 15 | 15 | 14 | 16 |
| 700-799 | 16 | 16 | 15 | 17 |
| 800-899 | 17 | 17 | 17 | 17 |
| 900-999 | 18 | 18 | 18 | 18 |
| 1000 | 20 | 20 | 20 | 20 |

Year: A.D. 1250. Statute of Doge Rainieri Zeno, August 6, 1250 (Predelli and Sacerdoti, 1903: 83-86; [VIII: 1-9]).

| Tonnage | anchors | buoys | hawsers | |
|---|---|---|---|---|
| | | | new | good condition |
| 200-299 | 7 | 7 | 7 | 7 |
| 300-399 | 10 | 10 | 10 | 10 |
| 400-499 | 13 | 13 | 13 | 13 |
| 500-599 | 15 | 15 | 15 | 15 |
| 600-699 | 16 | 16 | 16 | 16 |
| 700-799 | 17 | 17 | 17 | 17 |
| 800-899 | 18 | 18 | 18 | 18 |
| 900-999 | 19 | 18? | 20 | 20 |
| 1000 | 20 | 20 | 22 | 22 |

Year: A.D. 1250. Statutes on the *Tarrete* of Doge Ranieri Zeno, August 6, 1250 (Predelli and Sacerdoti, 1903: 170-171 [7-11]).

| Tonnage | anchors | buoys | hawsers | |
|---|---|---|---|---|
| | | | new | good condition |
| 200 | 6 | 6 | 6 | 3 |
| 250 | 7 | 7 | 7 | 4 |
| 300 | 8 | 8 | 9 | 4 |
| 350 | 9 | 9 | 9 | 5 |
| 400 | 10 | 10 | 10 | 5 |

[63] Tonnage given in *migliaia*; 1 *migliarium* = .47 dead weight tons (Lane, 1978 :248). The 13th-century maritime codes specify the mandatory number of *ancoris* (anchors), *indigarios* (anchor buoys), and *canapos* (hawsers). The vessels were required to have a certain number of new hawsers and a certain number of others in good condition.

# APPENDIX IV

## CHRONOLOGY OF VENICE[64]

| | |
|---|---|
| 5th and 6th centuries | Venetian lagoon settled;<br>Trade concentrated within lagoons and up riverine system of northern Italy. |
| A.D. 568 | Lombard invasion of Italy. |
| 697 | Venetians elect first Doge. |
| 9th century | Still active in riverine trade; influence spreading (Romagna region). Trade extended beyond Adriatic to Levant. |
| 828 | Appropriation of St. Mark's relics. |
| 830's | Formalized Venetian military fleet. |
| 992 | Venetian trading privileges in Constantinople (chrysobull of Basil II). |
| 1000 | Dalmatian piracy subdued. |
| 1054 | Final schism. |
| 1063 | First three crusades resulted in more Venetian trading rights. |
| 1082 | Byzantine emperor grants commercial privileges (including immunity from excise taxes) in exchange for naval aid against Normans. |
| 1099 | Commercial treaty with Imola (still involved in riverine trade). |
| 1102 | Venice conquered Sidon. |
| 1123 | Venice conquered Tyre. |
| 1170-1177 | Byzantine emperor arrested all Venetian traders in city.<br>Venice conquered Ragusa and Chios. |
| 1201-1204 | Fourth Crusade. |
| 1202 | Venice excommunicated by Rome for attacking Christian city. |
| 1204 | Constantinople sacked; Byzantine Empire divided.<br>Venice obtained Crete, plus chain of colonies from Venice to the Black Sea. |
| 1253-1268 | First Genoese War; struggle over Black Sea and Levantine trade. |
| ca. 1270 | Compass came into use in Mediterranean. Other improvements in the technology of navigation as well as shipbuilding. |
| 1289-1311 | Second Genoese War; War of Ferrara. |
| 1291 | Genoese eliminated Moslem control over straights of Gibralter; Italian ships faced no obstacle in reaching North Sea. |
| beginning in 1314 | State subsidized merchant galley convoys to Flanders/northern Europe, Syria/Cyprus, Romania (Black Sea), and Alexandria. |
| 1343-1354 | Third Genoese War; Venice defeated. |
| 1347-1354 | Plague, first attack of Black Death. |
| 1378-1381 | War of Chioggia; Genoa defeated. |
| 1388 | Treaty with Ottoman Turks. |
| 1404-1406 | Vicenza, Verona, and Padua submit to Venice (much needed mainland food supply). |
| 1416 | First of series of wars against Ottoman Turks. |
| 1463-1479 | Great War against the Turks; Venice lost. Subsequently paid annual tribute for Black Sea trade. |
| 1489 | Acquisition of Cyprus. |
| 16th century | Decline of Venice. |
| 1500-1573 | Discovery of new route to Indies undermined prosperity of Venice. |
| 1537-1540 | War with Ottomans. |
| 1570 | Turks attacked Cyprus. |
| 1571 | Battle of Lepanto; Venice won, but didn't follow up; |
| 1573 | Venice abandoned Cyprus to Turks. |

[64] Compiled from the following histories of Venice: Fasoli (1978); Lane (1974); Norwich (1977); and Langer (1940).

# APPENDIX V

## LETTERS OF PERMISSION

Lillian Ray
2501 Quarry Rd.
Austin, Tx. 78703

Procuratore, San Marco
Ufficio Tecnico
Venezia, Italia

Dear Sir or Madam,

I am currently writing my Masters Thesis on Venetian ships for a degree in Nautical Archaeology at Texas A & M University.

I am seeking written permission to reproduce the following works of art in my thesis in order to better describe Venetian ships. Proper source citation will be given in the thesis.

Mosaics:
Chapel of St. Clemente, vault and wall, 4
1100-1150
N. Transept, vault above Chapel of St. Isidore, 2
first ½ 12 C - closer to 1150
Chapel of St. Peter, left, 1
first ½ 12 C - closer to 1150
Zen Chapel, 2 mosaics.
c. 1270
Chapel of St. Isidore, inside chapel, walls, 3
c. 1350

Painting:
2 panels of Pala Feriale, cover for Pala D'Oro
by Paulo Veneziano and sons Luca + Giovanne 1345

Enamel:
Pala D'Oro
- Gold Alter screen perhaps by G.Boninsegna
1345
- enamel in bottom right, Byzantine original
11-12c

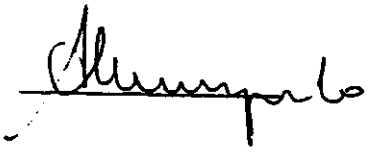
Sculpture:
"Paliotto" altar frontal of St. Mark
14th century

Shipbuilder and fisherman sculptures
13th c

Your attention to this matter will be greatly appreciated.

Sincerely,
Lillian Ray
Lillian Ray

PERMISSION GRANTED



Date 19-3-90

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Austin, Tx. 78703

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Zanetti, Girolamo. Della Origine di Alcune arti Principali. Venezia: Santini, 1841, p. 38. fig. 1.

Contarina ship models and photographic plates from excavation.

Your attention to this matter will be greatly appreciated.

Sincerely,
Lillian Ray
Lillian Ray

PERMISSION GRANTED
MUSEO STORICO NAVALE
CASTELLO 2148
30122 — VENEZIA

Date 5/2/90

IL CONSERVATORE
Ammiraglio di Divisione (R)
Mario Gottardi

Lillian Ray
2501 Quarry Rd.
Austin, Tx. 78703

Museo Correr
Piazzo San Marco
Venezia, Italia

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Maestro dei Cassoni Jarves. Storie di Alatiel.

Bartolomeodi, Paulo e Canterina d'Andrea

Coin minted in 931, Zoppetti collection
Your attention to this matter will be greatly appreciated.

Sincerely,
Lillian Ray
Lillian Ray

PERMISSION GRANTED

Date 29/2/90

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9 GIU. 1990

Dr.a Lillian Ray
2501 Quarry Rd.
Austin, Tx 78703
USA

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- cod. marc. Fr. Z. 17 (=230): Roman de Troie, ff. 21v, 22v, 38r, 26v, 37r.
- cod. marc. Gr. Z. 479 (=881): Oppianus, Cynegetica, ff. 2v, 39r, 61v.
- cod. marc. Gr. II, 17 (=1295): [Miscellanea], f. 20r.
- cod. marc. Lat. Z. 399 (=1610): Paulinus Venetus, Chronologia magna, ff. 76v, 78v,
- cod. marc. It. Z. 76 (=4783): Andrea Bianco, Atlante, f.9
.
- cod. marc. It. IV, 26 (=5131): Pre Theodoro di Nicolò, Istruzioni sul modo di fabbricar le galee, ff. .
- Breydenbach, De peregrinationibus in Terram Sanctam, Magonza, Erhard Reuwich 1486 [Inc. 382], xilografia tra i ff. 12-13.
- Fra' Mauro, Mappamondo, particolare con navi.

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"The Calling of the Apostles"
"The ship of St. Peter"

Your attention to this matter will be greatly appreciated.

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Remarks:
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| | (Cini 12999) |
| | (Cini 13040) |
| | (Cini 13055) |
| | (Cini 13055) |
| | (Cini 17140) |
| Detail, Pala d'Oro | (Cini 18986) |
| Botticelli, "Judgement of Paris" | (Cini 50401 + 50402) |

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I enclose copies of brief descriptions of the three manuscripts for which you lack additional information. With regard to MS.Canon.Class.Lat.81, you should also note P G Pasini, 'Matteo de'Pasti: problems of style and chronology', in Italian medals, ed J G Pollard (National Gallery of Art, Washington, Studies in the History of Art, vol. 21, 1987), 154-5 and figs. 16-17, where the miniatures are attributed not to Bettini but to Matteo de'Pasti.

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Muraro, Michelangelo, 1970, Paolo da Venezia, Penn. State University Press and University Park, figures 84, 87, 88.

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From: Rubin de Cervin, G.B., La Flotta di Venezia - The Venetian Fleet. Milan: Automobilia, 1985.

p. 21 Veneziano painting
Zibaldone da Canale

p. 24 Capstan reconstructions

p. 27 Mosaic from St. John Evangelist, Ravenna

p. 10-11 Reconstruction drawings by A. Chiggiato

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Sincerely,
Lillian Ray
Lillian Ray

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Austin, Tx. 78703

Dr. Marco Bonino
Via San Petronio Vecchio, 42
40125 Bologna, ITALY

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Fig. 9E, p. 175; fig. 10, p. 178; fig. 11A, p. 177; fig. 12B, p. 176; fig. 13, p. 179; fig. 14, p. 180; fig. 16, p. 182.

Proper source citation will be given in the thesis.

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Lillian Ray

Lillian Ray

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Marco Bonino

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Date 13 Marzo 1991

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# VITA

**Lillian Elizabeth Ray** was born December 13, 1961 to Thomas and Elvera Denk Ray in Miami, Florida. She grew up in Miami, Florida.

**EDUCATION:**

**Texas A & M University**, College Station, Texas, Master of Arts degree in Anthropology, specialization in Nautical Archaeology, 1991.

**University of Perugia**, Perugia, Italy, Fall, 1988,
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**Trinity University**, San Antonio, Texas, Bachelor of Arts degree in Art History and European Studies, 1984.

**Study in Greece**, Athens, Greece, Spring, 1983,
Greek art history, language and culture.

**Loyola University**, Rome, Italy, Fall, 1982,
Italian art history, language and culture.

**POSITIONS HELD:**

Graduate Research Assistant, Department of Nautical Archaeology, Texas A&M University; September, 1985 to June, 1986 and September, 1986 to June, 1987. Photographer and darkroom technician.

**FIELD EXPERIENCE:**

**W.V.C. Underwater Archaeology Projects: Scheurrak SO-1 and Molengat shipwrecks**, Texel, Netherlands. Archaeologist and photographer on 16th and 17th century shipwreck excavations, June-July, 1991.

**I.E.N.A.E. (Hellenic Institute of Marine Archaeology)**
**Dokos Island Excavation**, Dokos, Greece. Excavation of oldest known shipwreck site in 30+ meters, August, 1990.

**Phalasarna Excavation**, Crete, Greece.
Area supervisor and photographer at Classical and Hellenistic harbor site, June, 1990.

**Independent Research**, Venice, Italy.
Venetian medieval ship/boat iconography survey; churches, museums, and architecture of Venice, January-June, 1989.

**I.N.A and T.A.M.U. Ulu Burun Excavation**, Kas, Turkey.
Archaeologist and photographer on Late Bronze Age shipwreck, June through August, 1986, 1987, 1988.

**Canadian Palaipaphos Survey Project**, Kouklia, Cyprus.
Archaeological photographer, summer 1984.

**Caribbean Research Foundation Excavation**, Middle Caicos, British West Indies. Archaeologist at Arawak Indian coastal site, summer, 1981.

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