The Concept of Ports in the Medieval Eastern Mediterranean: Construction and Maintenance on Crete to the End of the Fifteenth Century

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The study of historic ports properly should be both multi- and interdisciplinary, and should include, at a minimum, history; architecture and urban architecture; geography and geology; marine engineering; archaeology; and sociology and antropology. I reached this understanding through a good deal of experience in research and teaching maritime history, underwater archaeology (including fieldwork) and architectural history. My main interest, as will be apparent in this essay, is the study of medieval ports. As obvious as this interdisciplinary perspective might seem, it has seldom been adopted by scholars, with the result that many studies are less convincing than they might be.

As a medievalist, I accept that it is fundamental to use both archival documents and secondary studies, which together provide basic data that are indispensable for any study. The texts need to be examined carefully, as any historian would do. At this point the other disciplines are tangential, although they often help to clarify arcane or imprecise language, as well as to enrich the study and put the evidence in its proper context.

Documents relating to medieval ports can provide a wealth of evidence, even though some of it may be at best only indirect. Still, they help to understand the motivation to construct a port, as well as explanations for its geographic setting and, where appropriate, for its decay. They can shed light on the role a port plays within a local, regional or national economy, and can help us to comprehend port design, installation, construction and maintenance (or lack thereof). They frequently tell us something about the relationship between the port and the port town, which are often not the same entity. There may be evidence about architecture, marine engineering or contemporary vessels and their own particular needs. Or they may tell us about the workforce involved in construction, maintenance and administration, or who work in port-related

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industries, such as shipbuilding and repair, stevedoring and porterage, and the like. Sociology and anthropology can often help to interpret such evidence in the broadest possible context.

Geography, geology and marine engineering can then assist us in understanding some aspects of the physical condition of ports which, after all, are created in a specific spot because of perceptions about currents, waves and winds. Marine engineering may also help us to grasp the processes of planning, construction and maintenance.

Urban architecture (and archaeology as well) requires the use not only of historic data but also fieldwork. The latter process can verify whether the material remains are in agreement with the archival data or whether they require us to refine what we learn from the documents. This discipline can contribute to our knowledge of port design and construction in particular. Underwater archaeology is essential if we are to examine the material remains under the sea. Such artifacts include shipwrecks, which by their presence or absence can often testify of port activity or decay. Moreover, the architectonic remnants of quays, moles and breakwaters are essential and provide much information not recorded by contemporaries. Frequently, architectonic remnants found underwater came from structures originally built on land, thereby enabling the reconstruction of the topography of the coastal zone as it previously existed. For example, such evidence might show how a water zone became land and eventually led an inland town to become coastal, like medieval Caesarea.[1] These remnants may also suggest something about the depth of water inside a port (especially an artificial port). Geologists may then be able to advance plausible explanations for such phenomena.

An appreciation of the design of ships is also central to understanding the navigational capabilities of vessels and hence the routes likely to be preferred and the requirements for ports *en route*. It is important to recognize whether there was a direct relationship between the building of ports and the location of major shipping lanes, or whether the construction of a port can lead to a shift in shipping routes. A comprehension of ship design is also crucial, because it can point at an early stage to possible problems in anchoring inside ports.

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[1]R. Gertwagen, "Crusader Caesarea, From a Port Town to a Coastal Town," in Bella S. Gallil and Y. Mart (eds.), *The Mediterranean Continental Margin of Israel* (Haifa, 1991).

Marine engineering would explain the causes for such difficulties and for the problems of port maintenance. This discipline is also essential for matters of basic terminology, such as the difference between moles (piers), breakwaters and quays. Moles and breakwaters are built under water, from the seabed to the surface; the main question normally is about the construction technique. Quays, on the other hand, are built using "dry land" techniques, and might even be constructed of wood.[2]

The study of medieval eastern Mediterranean ports is in its infancy, and only on rare occasions has it been interdisciplinary. Almost all studies done in the urban architectural tradition have been concerned with ancient history – the Hellenic, Roman and, occasionally, the Byzantine years – or with the Renaissance era (from the late fifteenth century). The medieval period has been neglected.

Similarly, historians and archaeologists have tended to study the ports of the eastern Mediterranean in isolation. Moreover, only a few sites have been excavated, and most studies have been done by archaeologists whose real expertise is in earlier periods.[3] Not being familiar with the

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[2]Alfonzo De F. Quinn, *Design and Construction of Port and Marine Structures* (New York, 1961), 173, 189 and 214-242. A wooden quay existed, for example, in medieval Famagusta, Cyprus; see R. Gertwagen, "Maritime Activity Concerning the Ports and Harbours of Cyprus from the Late 12th Century to the Late 16th (1191-1571)," in N. Coureas and J. Riley Smith (eds.), *Cyprus and the Crusades* (Nicosia, 1995), 522 and note 110.

[3]A good example is the port of Acre, first excavated in the early 1960s, and again in 1975, by an archaeologist whose expertise is really in the Roman period. Moreover, unfamiliarity with early Moslem texts led this team to destroy the quay/mole. See A. Raban, "Acre. The Sea," in E. Stern (ed.), *The New Encyclopedia of Archaeological Excavations in the Holy Land* (Jerusalem, 1992), III, 1237-1240. For new, interdisciplinary research that also comments on earlier work, see R. Gertwagen, "The Crusader Port of Acre: Layout and Problems of Maintenance," in M. Balard (ed.), *Autour de la Première Croisade* (Paris, 1966), 553-582 (Arabic texts concerning the technique of construction of the quay, and verification using material remains, are on 555-558). Unfamiliarity with what the medieval Venetians had done at the port of Modon, in the southwestern Pelopponese, the Greek archaeologist reached the wrong conclusions about its design and construction techniques, and misdated the maritime castle that protected the port. See N. Llanos, "Il Castello da Mare di Methoni," in G. Carbonara and F. Petrafitta (eds.), *Dieci Tesi de Restauro (1982-1985)* (Rome, 1987), 61-74. I would like to thank Dr. Llanos for providing me with oral information about his work. For a new interdisciplinary perspective on Modon, see R. Gertwagen, "Venetian Modon and Its Port (1358-1500)," in A. Cowan (ed.), *Mediterranean Urban Culture* (Exeter, 2000), 125-148.

medieval period, they treat these ports like ancient ones. Consequently, they offer unrealistic descriptions of the design of medieval ports which contradict the documentary evidence; invent ports in places where they did not exist; or misinterpret the remains. In the worst cases, they destroy irreplaceable remnants. Since the politics of fund-raising are often involved, archaeologists tend to be unwilling to admit previous errors. This means that important questions are too often either obscured or ignored. Even worse, given the modern tendency to redevelop historic sites, including ports, as urban renewal projects or tourist attractions, wrong information may lead to the final destruction of significant medieval locations.

While there is no way to guarantee that errors will never occur, collaboration between archaeologists and medieval historians should go a long way toward preventing such abuses. Unfortunately, there generally is little communication between practitioners of the two disciplines, and historians seem all too willing to rely on the often questionable data uncovered by archaeologists. Lacking the technical skills to verify the information, historians tend to interpret documents to agree with the archaeological data.[4]

Furthermore, modern studies of eastern Mediterranean ports from about 400 to 1500 have dealt mainly with their functions, an approach which fits well into the paradigms established by J. Gilissen and Charles Verlinden. Their studies were published, along with a number of others on more specific themes, in 1974 in three volumes dedicated to ports from ancient times to the modern era.[5] Many of these studies shared common characteristics. While all dealt with port functions, none differentiated

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[4]Mislead by archaeologists who worked at Acre in 1961 and 1972, D. Jacoby reached erroneous conclusions about its design and the fate of its mole, which he claimed had been dismantled during fortification operations in 1750-1751. See Jacoby, "Crusader Acre in the Thirteenth Century: Urban Layout," *Studi Medievali*, Third series, XX, No. 1 (1970), esp. 9 and note 58; and Jacoby, "Venetian Anchors for Crusader Acre," *Mariner's Mirror*, VII (1985), 5-12. For the proper reconstruction of the port, see Gertwagen, "Crusader Acre," 561-569 and 579, figure 1.

[5]C. Verlinden, "Les Grandes Escales, synthèse gènèrale vue sous l'angle économique," *Recueils de la société Jean Bodin pour l'histoire comparative des Institutions. Les Grandes Escales,* XXXIV (1974), 657-679; and J. Gilissen, "Une Typologie des escales, historie des grandes escales vue sous l'angle institutionnel," *ibid.*, 681-731.

between artificial ports, natural harbours or havens, and coastal settlements. Unfortunately, little has changed since then.[6] In my view this mistake is the result of two main factors. First, there is the natural tendency to relate a port's role to the urban centre it serves. In other words, scholars have tended to identify all ports of call, even if artificial, as natural havens. This is very common, especially for islands like Crete. The other problem has to do with sources. To be blunt, scholars have been more interested in focussing upon those records that illuminate functions. Many times such sources, whether using the Latin term *portus* or the Greek *limen*, applied the same word to both natural havens and artificial harbours. In order to separate the two, researchers need to use a variety of documents, including *portolans*, verbal descriptions, and construction and maintenance records.

Mislead by the documents and by their preconceptions, scholars have ignored many important questions. Why, for example, did some coastal settlements flourish as commercial towns without artificial ports? What criteria led to decisions to construct an artificial port? What impact did newly-built ports have on older harbours and anchorages? What were the problems of construction and maintenance of artificial ports? What were the politics and economics? What about the design of such ports?

This essay is aimed primarily at historians interested in enlarging the scope of their discipline and at archaeologists and urban architects interested in an interdisciplinary approach. Medieval Crete, which is discussed in this essay, has been studied mainly by historians and archaeologists interested in landward activities. For historians, medieval Crete is an instructive example of the problems mentioned above. The Early Moslem period (ninth and tenth centuries), the Byzantine era (up to the beginning of the thirteenth century) and the Venetian years, which started right after the Fourth Crusade in 1204, have attracted the most

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[6]See, for example, J.E. Dotson, "Naval Strategy in the First Genoese-Venetian War, 1257-1270," *American Neptune,* XLVI, No. 2 (1986), 84-90; Dotson, "Economics and Logistics of Galley Warfare," in R. Gardiner and J. Morrison (eds.), *The Age of the Galley* (London, 1995), 218-219; and J.H. Pryor, *Geography, Technology and War. Studies in the Maritime History of the Mediterranean 649-1571* (Cambridge, 1988).

attention from scholars.[7] Since the latter is the best documented, it will be the main era dealt with in this essay. The study of Venetian Crete, limited here to the period before 1500, proves that essential topics related to the maritime aspects of the island are rooted in earlier epochs, which therefore cannot be ignored. References are made to the earlier periods, especially from the ninth century, whenever evidence permits.

The Fourth Crusade, which ended with the conquest of Constantinople, the capital of the Byzantine Empire, contributed to the foundation of the Venetian maritime empire. After 1204, the vast Byzantine territories in the central and northeastern Mediterranean were divided among the conquerors according to a partition agreement made on the eve of the conquest. Venice was allotted three-eighths of the former Byzantine Empire, and the Venetian Doge added to his title "[The] Lord of One Quarter and One Half [of a quarter] of the Empire of Romania."[8] The Venetian choice of territories, as well as their conquests in the Aegean shortly thereafter, demonstrated their policy. Venice aimed to possess those strategic maritime posts which enabled the naval control of the eastern Mediterranean. These were situated along the main sea routes crossing the Adriatic via the Ionian to Constantinople and the Black Sea on one hand, as well as to the Levant and Egypt. These naval bases included Dalmatia, in the eastern Adriatic; the island of Corfu in the northern Ionian Sea; Modon and Coron in the southwest Peloponnese; Negroponte (Eubea) in the northern Aegean; and several islands in the

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[7]On the Early Moslem period, see V. Christides, *The Conquest of Crete by the Arabs Ca. 824. A Turning Point in the Struggle between Byzantium and Islam* (Athens, 1984). Although thoroughly analyzing the maritime activities of the Moslems of Crete, the author ignored the construction of ports, despite the fact that the Moslem port of Candia, the capital of the island, was referred to in Venetian documents from the late thirteenth century. The most thorough study of Byzantine Crete is D. Tsougarakis, *Byzantine Crete from the 5th Century to the Venetian Conquest* (Athens, 1988). Many of the studies on the Venetian era are cited throughout this paper.

[8]W. Miller, *The Latins in The Levant: A History of Frankish Greece, 1204-1566* (New York, 1908), 27-30; and F.C. Lane, *Venice, A Maritime Republic* (London, 1973), 36-42.

central Aegean.[9] The island of Crete, in the southwestern Aegean, was the only one that was purchased by the Venetians.

It is generally assumed that Crete was occupied by the Venetians in 1204 for its economic and strategic importance, as well as because its ports provided refuge for ships. Gallina, for example, emphasized the maritime importance of Crete on the eve of the Fourth Crusade.[10] Yet a careful study of the island's ports reveals the reverse. I argue that Crete in fact was outside the Aegean sea lanes on the eve of the Venetian occupation but that subsequent geopolitical shifts altered this. Moreover, I will show that there was a connection between the development of the artificial ports on Crete and the island's role in the Aegean. But it is important to recognize that there were no artificial ports in operating condition on Crete on the eve of the Venetian occupation, and that such ports did not function properly during Venetian rule. Nevertheless, the island became the main Venetian transshipment port and naval base in the eastern Mediterranean by the fourteenth century. This paper will focus on the port of Candia which, relative to the other artificial ports on the island, provides the richest vein of historical evidence on its construction, maintenance and facilities. Where relevant, I will also refer to the other two ports built during Venetian rule, Rethimon and Chania.

Crete's Position on Aegean Sea Lanes

Several factors combined to create favoured trunk routes for long- distance voyages in the Mediterranean: geography, including topography and the configuration of the coasts; meteorological conditions, including prevailing

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[9]Lane, *Venice, A Maritime Republic*, 43; and F. Thiriet, *La Romanie vénitienne, le développement et l'exploitation du domaine colonial-vénitienne (XIIe-XVe siècles)* (Paris, 1975), 77. Dotson, "Economics and Logistics," 219, ignored Corfu. Coron, in the southwest Peloponnese, which had not been originally required by Venice, was annexed to its empire after having been conquered in 1207. See D. Jacoby, *La féodalité en Grèce médiévale les "Assises de Romanie," sources, applications et diffusion* (Paris, 1971), 223.

[10]S. Borsari, *Il dominio veneziano a Creta nel secolo XIII* (Naples, 1963), 9-10; R. Cessi, *Storia della Repubblica di Venezia* (reprint, Florence, 1981), 196; Thiriet, *La Romanie vénitienne*, 108 and 122-124; Thiriet, "Sui dissidi sorti tra il comune di Venezia e i suoi feudatari di Creta nel Trecento," in Thiriet, *Etudes sur la Romanie greco-vénitienne (Xe-XVe siècles)* (London, 1977), 699-700; Dotson, "Economics and Logistics," 219; and M. Gallina, *Una Società Coloniale del trecento Creta Fra Venezia e Bisanzio* (Venice, 1989), 1-2 and notes 1 and 3.

winds; oceanographic characteristics, especially the direction and strength of the currents; and technological limitations, especially those of ships. According to Dotson and Pryor, these constraints obliged medieval vessels, especially the galleys (*galeae*), to stick to the coasts, particularly in the northern Mediterranean - which was littered with a considerable number of islands, capes and bays - unless they were forced to go elsewhere by political, economic or commercial considerations. Further, there is evidence that eventually the round sailing ships (*naves*) sailed the same routes as the galleys, although they did not use the same number of ports.[11] Using a wide variety of sources Pryor showed that the upwind performance of cogs, carracks and the great sailing galleys of the fourteenth and fifteenth centuries was little better than that of the old lateen-rigged round ships and light galleys of the twelfth and thirteenth centuries.[12] While voyages made in the face of adverse winds and currents cannot be ignored, they were certainly not common.

Roger of Hoveden's discussion of the itineraries of Richard Coeur de Lion and Philip Augustus from Marseilles to Acre for the Third Crusade in 1191 is instructive on the marginal position of Crete. Two alternative routes enabled ships to pass between the eastern and western Mediterranean, the Sicilian Channel and the Ionian Sea. Roger of Hoveden considered taking the shorter route via the Sicilian Channel, but recommended it only when sailing with the prevailing winds. Even then, the *naves* had to take care not to get too close to the hostile North African Coast.[13] Furthermore, contrary winds could make the voyage unbearable,

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[11]Dotson, "Naval Strategy," 84-88; Dotson, "Economics and Logistics," 217-222; Pryor, *Geography, Technology and War*, 21-24, 37-39 and 51-55; Pryor, "The Geographical Conditions of Galley Navigation," in Gardiner and Morrison (eds.), *Age of the Galley*, 206-216; Pryor, "The Mediterranean Round Ship," in R. Gardiner and R.W. Unger (eds.), *Cogs, Caravels and Galleons* (London, 1994), 73-76; M. Balard, "Coastal Shipping and Navigation in the Mediterranean," in *ibid.*, 131-132; and E. Malamut, *Les iles de L'empire Byzantin VIIIe-XIIe* siècles (2 vols., Paris, 1988), II, 549-551. Sometimes Malamut draws erroneous inferences from the coastal trade about the position of Crete as a major transshipment port. Vessels deviated for a variety of reasons from the main sea routes.

[12]Pryor, *Geography, Technology and War*, 51-54.

[13]"Chronica Magistri Rogeri de Houedene," in W. Stubbs (ed.), *Rerum Britanicarum medii aevi scriptores, LI* (3 vols., London, 1870; reprint, 1966), III, 160. Pryor, *Geography, Technology and War*, 70, wrongly adapted Roger de Hoveden's

even for large commercial ships. Although made during different seasons, the voyages of Ibn Jubair to Alexandria (March 1183), Jacque de Vitry to Acre (September 1216) and King Louis IX to the Levant (August 1248) experienced similar navigational difficulties. This course was rare even for sailing vessels of the late fourteenth and fifteenth centuries.

The following evidence is instructive. In 1394, a convoy of five *naves*, one of which carried Nicholas de Matono, sailed from Gaeta, in western Italy, to the Levant. A storm prevented the ships from making the Messina Channel, and they had to sail along the western coast of Sicily and past the islands to the south. The fleet did not cross directly from southeastern Sicily to the Levant via the southern coast of Crete. Instead, it took the longer route, sailing up the eastern coast of Sicily and southeastern Italy, via the Ionian and southwestern Pelopponese to the southern Cyclades and then on to the Levant. In 1418, the *naves* of the *nef* type carrying Le Seigneur de Caumont took the same route.[14]

It should be emphasized that after having crossed the Sicilian Channel heading east, shipping was exposed to strong winds from every direction. The vessels could not find shelter along the hostile southern

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preconditioned recommendation of the route to be taken. Relying on Pryor, D. Jacoby, "Byzantine Crete in the Navigation and Trade Networks of Venice and Genoa," in L. Baletto (ed.), *Oriente e Occidente tra medioevo ed eta moderna. Studi in onore di Geo Pistarino* (Acqui Terme, 1997), 537 and note 83. The lateen sail could make a vessel unstable in a strong following wind; I. Friel, "The Carrack: The Advent of the Full Rigged Ship," in Gardiner and Unger (eds.), *Cogs, Caravels and Galleons*, 78.

[14]Ibn Jubair, *Voyages, Traduits et annotes par M. Gaudefroy-Demombynes* (Paris, 1949), 36-37, J.H. Pryor, "The Voyage of Jacque de Vitry from Genoa to Acre in 1261: Juridical and Economic Problems in Medieval Navigation," in M.J. Pelaez (ed.), *Derech de la Navigacion en Europa, homenaje a F. Valls I Taberner* (Barcelona, 1987), 1707-1711; Pryor, "The Naval Architecture of Crusader Transport Ships, Part II," *Mariner's Mirror*, LXX (1984), 380; "Nicholai de Marthono, notarii, liber peregrinationis ad Loca Sancta," *Revue de l'Orient Latin*, III (1895), 566-669; and Le Marquis de la Grange (ed.), *Voyaige d'Oultremer en Jhérusalem par le Seigneur de Caumont l'ann MCCCXVIII* (Paris, 1858) 38-41. The evidence proves that Jacoby's use of Ibn Jubair to claim the importance of Crete to Genoese navigation is erroneous; see D. Jacoby, "Creta e Venezia nel contesto economico del Mediterraneo orientale sino alla metà del quattrocento," in G. Ortalli (ed.), *Venezia e Creta* (Venice, 1998), 76-77; and Jacoby, "Byzantine Crete," 537. See also J.C. Hocquet, "Productivity Gains and Technological Change. Venetian Naval Architecture at the End of the Middle Ages," *Journal of European Economic History*, XXIV, No. 3 (1993), 538-539; and Balard, "Coastal Shipping,"135.

coast of Crete, where the bays were open to both southern winds and strong northern squalls descending from the south-facing Cretan mountains. Nor could the bays provide appropriate shelter because of their great depths. In the fifteenth century, a small Cretan ship of the *gripera* type, lateen-sailed, was blown by a strong storm from its anchorage at Ierapetra, on the southeastern coast of the island, all the way to Alexandria. No wonder Roger of Hoveden in the late twelfth century prohibited galleys from using this route due to the danger of being caught in the open. This threat was attributed to their low freeboard, which prevented them heeling too far. The galleys would have found the summer waves of up to one metre challenging, and the average winter waves of 1.2 metres beyond their capabilities. A heel of more than ten degrees put the leeward oars of the galleys in danger of being smashed by the wave crests, an event that would have made them unmanageable.[15]

The preferred sea route from the western Mediterranean to Acre was undoubtedly via the Messina Channel. That was the sea lane taken by the Pisa and Genoa fleets bound to the Levant in 1099 and 1104, as well as Philip August's and Richard Coeur de Lion's fleets in 1191. Crete was mentioned only in Richard Coeur de Lion's itinerary. He arrived there by accident to gather his fleet, which had been scattered by a strong storm near the southeastern tip of Calabria. Crete was identified as "[t]his island [that] is about midway between the Messina Channel and the city of Acre in Palestine." But this was clearly meant to be the geographic location of the island, not a reference to its position along a sea lane. It is true that Frederick II's fleet from Otranto to the Levant in July 1228 also anchored in Crete – in Suda Bay. Following his itinerary, however, one can clearly observe that Frederick sailed during the day, spending the nights at anchor. He undoubtedly took advantage of a favourable following wind to

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[15] *Mediterranean Pilot* (10th ed., 5 vols., London, 1987), IV, 101. The ship blown from Ierapetra was loading marble columns; its owner applied to Venice for compensation, a plea which the Venetian Senate sent to the *signoria* of Crete. See Archivio di Stato di Venezia (ASV), Duca di Candia, Lettere Ricevute, B1, No. 15, f. 34v (22 April 1433). For the *gripera* ship type, see A. Jal, *Glossaire nautique, repertoire polygotte de termes marine anciens et modernes* (2 vols., Paris, 1948), I, 802-803; and Christiane Villain-Gandossi, "Typologie des navires utilises sur les routes de l'Orient mediterraneen," in K. Friedland (ed.), *Maritime Aspects of Migration* (Köln, 1989), 59. The Bay of Ierapetra provides protection against the winds from the north-northwest only. *Mediterranean Pilot*, IV, 134-135; "Chronica Magistri Rogeri de Hovedene," 160; and Pryor, "Geographical Conditions," 214.

reach Crete at six o'clock in the evening after having left the island of Cerigo at dawn. Based on the evidence adduced here, one can safely conclude that war fleets anchored in Crete, while sailing from the Ionian to the southeastern Mediterranean, only on rare occasions.[16]

There is one factor which, in the absence of other over-riding conditions, determined conclusively the location of the main sea lanes and anchorages. This factor, ignored by Dotson and Pryor, was the voyage that had to be made against prevailing winds and currents. In the present context, it is clear that Crete was not on the regular sea route from Egypt and the Levant to the western Mediterranean via the Sicilian Channel or the Straits of Messina. The experience of Ibn Jubair in November 1184 demonstrates the risks involved in sailing from Acre to the western Mediterranean via the southern coast of Crete on a *navis* propelled by lateen sails. The Genoese only succeeded with difficulty in reaching the southwestern end of the Island when the strong westerlies pushed the vessel out to sea. Eventually, he had to sail from northeastern Crete to the Ionian Sea and the Straits of Messina. Because of their hull design, the medieval round ships could maintain a real course at ninety degrees only with great difficulty, even when the wind was less than a gale. Tacking was almost out of the question. The war galleys likely would have been swamped had they experienced similar conditions.[17]

Roger of Hoveden's statement further supports my argument. Referring to the route Philip Augustus took back to France from the Levant in August 1191, he remarked that "et est sciendum, quod cum perventum fuerit ad insulam de Rodes, praeteritur tertia pars viae maris inter Accon et Brindisium." Crete was not mentioned. Nor did the King

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[16]Anne Comnène, *Alexiade, règne l'empereur Alexis I Comnène (1081-1118)* (6 vols., Paris, 1945), III, book 11, 41 and 47. For a thorough discussion of the sea lane to both basins of the Mediterranean via the Messina Straits, see Gertwagen, "Venetian Modon," 127-129. See also "Ricardo Canonico Sanctae Trinitatis Londoniensis, Itinerarium Peregrinorium et Gesta Regis Ricardi," in W. Stubbs (ed.), *The Chronicles and Memorials of the Reign of Richard I* (reprint, London, 1964), I, book 2, 176-177 and 179; and J-L-A. Huillard Bréholles, *Historia Diplomatica Frederici Secundi* (Paris, 1852), I, book 2, 899.

[17]Jubair, *Voyages*, 369-371. Jubair's description of the continuation of the voyage proves the captain's further unprofessional conduct in refusing to take a local pilot across the Messina Channel, as was common practice. Consequently, the ship could hardly sail up the straits and eventually was wrecked near the port town of Messina; *ibid.*, 375-376. See also Pryor, "Mediterranean Round Ship," 72-74.

of France visit the island while sailing from Rhodes to Monemvasia, along the eastern coast of the Peloponese and thence via Cape Malea, Coron and Modon to Corfu. Unfortunately, the route from Rhodes to Monemvasia was not described in detail. Yet sailing on the high seas against the prevailing northerlies, or *meltemi*, might have been dangerous. He undoubtedly sailed through the Cyclades, probably along the same route taken by the *navis* on which Nicholas of Martono sailed from Rhodes to Venice in January 1395. After reaching the island of Leros, the *navis* turned west-southwest to Naxos, thence to Paros and Siphnos, aiming to reach the Peloponnese through the islets of Falkonera Karvi, unless caught by corsairs off the Fernia. The galleys of Philip August could have entered the Cyclades from the island of Cos to Amorgos, thence through Naxos to Monemvasia, along the aforesaid route (see figure 1). These islands could also afford shelter against the strong prevailing winds.[18]

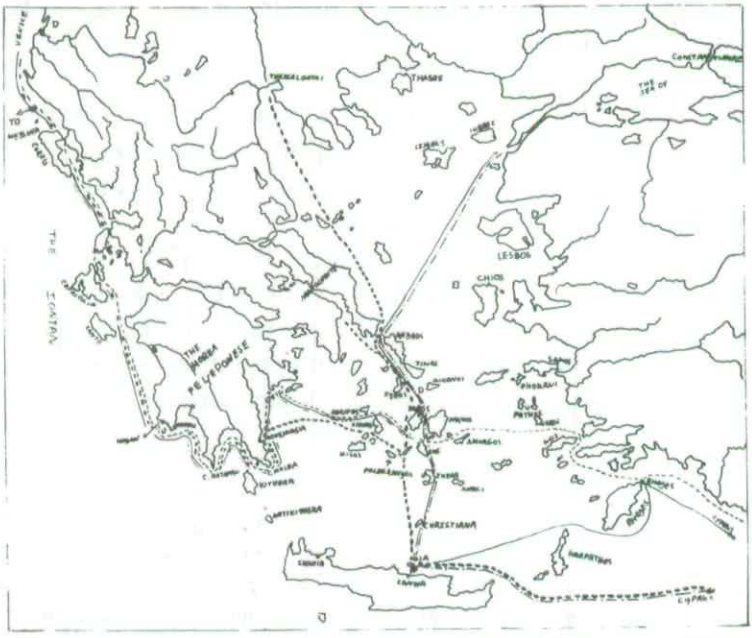

Figure 1: Crete and the Aegean Sea Routes. Before 1230s: - - -; 1230s-1261: _· _· _·; 1261-1268: ....; since 1268: _____.

Source: Courtesy of the author.

[18]"Chronica Magistri Rogeri de Hovedene," 160 and 165; and "Nicolai de Marthono Notarii, liber peregrinationis ad Loca Sancta," 643-647.

We can safely conclude that Crete, in contrast to Naxos, was outside the main sea route from Egypt and the Levant to the northwestern Aegean. The central location of Naxos in the southern Cyclades motivated Venice to demand it in the partition agreement on the eve of the Fourth Crusade. Its strategic location also led Marino Sanudo to occupy it in 1206 and to make it the "capital" of the Duchy he created in the Cyclades, which included the islands of Paros, Melos, Siphnos and Syros. The sea routes through the central Aegean passed among these islands.[19]

On the other hand, one can safely argue that due to the marginal position of Crete in relation to the main trunk Aegean sea lanes the Venetians did not mind that Boniface of Monteserrat, one of the Crusader leaders in 1204, continued to hold the island, even though they were well aware of its economic advantages. One has to bear in mind that in 1204, in anticipation of the capture of Constantinople, Venice compelled its allies to grant it the commercial privileges and tax exemptions enjoyed in the Byzantine Empire. It was only when the Doge learnt about Boniface's offer to sell Crete to the Genoese that the Venetian attitude changed. The Doge took advantage of the long-delayed Genoese response to persuade Boniface to sell the island to Venice, thereby preventing Genoa from acquiring a foothold in the Latin Empire. One should not, however, ignore the economic motive. A Genoese dominion in Crete might have cancelled the excessive privileges the Venetians had ensured themselves. Moreover, their trade might have been limited or they might have been compelled to pay very high taxes. Eventually, Venetian policy triggered Genoese hostility and support for the Byzantines. Furthermore, the marginal importance of Crete to the Venetians at the time is demonstrated by their unwillingness to establish immediate control over Crete. This delay was taken advantage of by Enricus Pescatore and Almanus da Costa, two corsairs who, supported by the Genoese, invaded Crete and controlled the island during the first two decades of the thirteenth century. Pescatore held Crete from 1206, while the latter held Candia between 1215 and 1217. Costa's capture by the Venetians in 1217 led to a peace treaty with the

[19]Thiriet, *La Romanie vénitienne*, 82. Unfortunately, the impact of the geographic basis and maritime aspects of Venetian policy have been ignored completely by scholars.

Genoese the next year; the duration initially was for ten years, but it was in fact renewed until the 1250s.[20]

The *portolan* "Il Compasso da Navigare," compiled in the mid-thirteenth century, is instructive about the marginal position of Crete relative to the Aegean sea lanes. This *portolan* treated Crete as a deviation from the main sea route from the southern Cyclades to Rhodes, along which Santorin was the main port of call.[21] In other words, the Venetian acquisition of Crete did not immediately alter the role of the island in the eastern Mediterranean. Nor did it change when the two pirates mentioned above controlled the island in the early thirteenth century.

The alteration in the importance of Crete was due to geopolitical shifts in the eastern Aegean in the fourth decade of the thirteenth century. The success of the Byzantines, whose centre was in Nicea, in conquering the southern Dodecanese islands led by the end of 1230 to their control over the islands off the Aegean coast of Anatolia, from Lesbos in the north to Karpathos in the south. The map of the political division of the Aegean in the thirteenth century, compiled by Thiriet, makes the point very clear. One consequence was that Naxos and Amorgos, another important port of call to Rhodes, lost their importance to Crete. Until the establishment of amicable relationships between the Latins and the revived Byzantine empire in 1260s, Crete became a port of call for all Latin and Venetian ships sailing between the northern Aegean and the Levant. Most hazardous was the route back from the Levant, as vessels had to sail on the high seas from Cyprus westwards, keeping as much as possible south of Byzantine-

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[20]D. Jacoby, "Italian Privileges and Trade in Byzantium before the Fourth Crusade: A Reconsideration," *Annuario de Estudios Medievales*, II (1994), 355; Miller, *Latins*, 29-30; and J.K. Fotheringham, "Genoa and the Fourth Crusade," *English Historical Review*, XXV (1910), 4-41; D. Abulafia, "Henry Count of Malta and his Mediterranean Activities: 1203-1230," in Abulafia, *Italy, Sicily and the Mediterranean, 1100-1400* (London, 1987), 105, 111 and 113-118; and G. Ortalli, "Venezia e Creta. Fortune e contraccolpi di una conquista," in Ortalli (ed.), *Venezia e Creta*, 16 and note 21.

[21]R. Motzo, *Il Compasso da Navigare, opera italiana della meta del secolo XIII* (Cagliari, 1947), 50 and 55.

held Rhodes and Karpathos. This dangerous detour was used until the first truce between the Venetians and the Byzantine in 1268.[22]

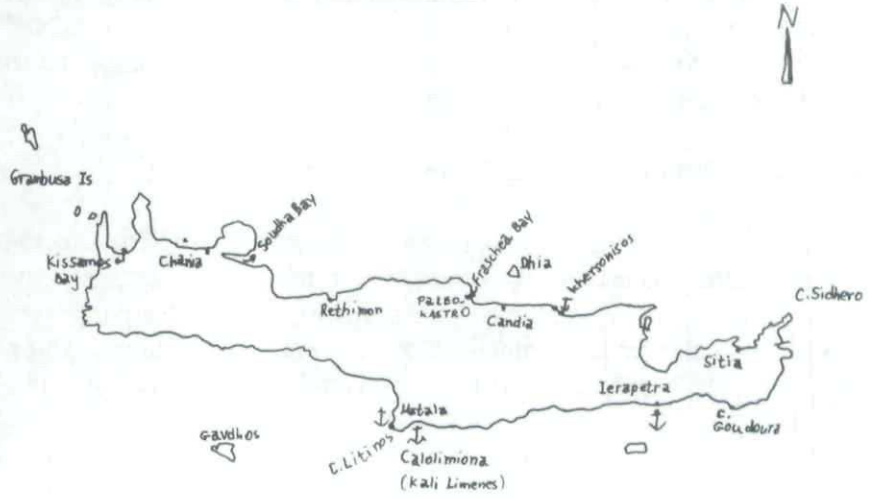

Figure 2: The Island of Crete

Source: R. Heikel, *The Greek Waters Pilot* (4th ed., London, 1990), 335.

The experience of Ibn Jubair, mentioned above, demonstrated the navigational risks for craft making their way against the strong westerlies. Sailing on the high seas, the ships were also exposed to southerly and strong northerly winds. In the fifteenth century, the stormy northerlies forced the small commercial vessel, propelled by sails and oars, that carried Buondelmonti to divert away from the northeastern point of Crete in favour of Cape Goudoura, at the southeastern end of the island. This vessel, most probably of the *gripera* type, sailed from Cape Goudoura along the southern coast of Crete (see figure 2) and circled the whole island. It should be pointed out, that this vessel arrived at Crete to engage

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[22]Jacoby claims that the strategic importance of Crete grew only at the beginning of the thirteenth century as a result of its fiscal and economic exploitation by Venice and Genoa. See Jacoby, "Byzantine Crete," 517-518 and 540; and Jacoby, "Creta e Venezia," 73. Yet he argues that Crete was not an obligatory port of call between Venice and the Levant during the 1270s ("Creta e Venezia," 95). See also Thiriet, *La Romanie vénitienne*, 83 and 149-150; and H. Ahrweiler, *Byzance et la mer* (Paris, 1966), 311-317.

in the local coastal trade. In such circumstances, the sea lane taken was definitely not the best, although it could have been accomplished as long as the crew was familiar with the hazards en route. Fortunately, in this case the crew and the pilot were Cretans. While such navigation enabled Buondelmonti to make a thorough tour of the island and its coasts, it also shows why the sea route went along the island's north coast.[23]

Position of Cretan Ports Relative to Aegean Sea Lanes

There was a direct connection between the favoured routes crossing the eastern Mediterranean, mainly from south to north, via Crete, and the construction of ports along the island's northern coast. Three ports were constructed, enlarged and maintained by the Venetians: Candia/Iraklion, Rethimon and Chania. These ports were all on the western section of this coast.

To avoid sailing on the open seas with exposure to the adverse northerlies, vessels took the route through the Cyclades, via Christiana and Santorini/Thera. The advantage of the geographic location of the Bay of Candia/Iraklion and of the island Standea/Dia north of it – both are opposite Christiana and Thera/Santorini – is obvious.

The position of the Bay of Iraklion led the Moslems, who conquered Crete in the ninth century, to be the first group in the Middle Ages to build an artificial port, complete with a mole. As a result, Candia became the main port on the island. The Moslems aimed to expand their commercial interests in the northern Aegean; until the second decade of the tenth century they occupied the islands of Christiana, north to Dia, Thera, Ios, Naxos Paros and Aegina, which gave them access to Athens. In the northwest Aegean they occupied the island of Elaphonesos (Carvi), below Cape Malea, which provided access to the Peloponnese. It is unlikely that the ships of the ninth and tenth centuries, and certainly not the official commercial or military convoys, would have dared to take the

[23]Cristoforo Buondelmonti, *Descriptio Insule Crete et Liber Insularum, cap. XI: Creta* (Iraklion, 1981). This treaty was of the *portolan* type, like the ones he made throughout the Archipelago; see Biblioteca Nazionale Marciana, Venezia (BNMV), Ital. Class. VI. Cod. XIX, (=6087), secolo XVI, *Isolario*. The evidence of Buondelmonti and Jubair shows that Jacoby is mistaken that the common route from the eastern Mediterranean to the Peloponnnese passed along the southern coast of Crete. The author of the *portolan* of 1271, or his sources, must have undergone the same experience as Buondelmonti. See Jacoby, "Creta e Venezia," 95 and note 104.

shorter route to the Peloponnese from Rethimon or Chania, via the islands of Antikithera, medieval Cerigotto and Kithera, medieval Cerigo, on the open seas given the adverse northerlies.[24] No wonder the maritime aspect of the history of both Rethimon and Chania was completely unknown during the Muslim era.

The foundation of Moslem Candia, on the other hand, changed the system of sea lanes for their navies heading to the northeastern Mediterranean from the Levant. The route taken by the navy of Leo of Tripoli in 904 to attack Thessaloniki and Lesbos, which is shown on the map compiled by Christides, makes the point extremely well. Lombard claims that the key position of Crete on the sea lanes in the eastern Mediterranean made the island the main Moslem base in the Mediterranean.[25]

The location of the main port was obviously the decisive factor in building the Moslem capital adjacent. The capital was a fortified city encircled by a moat (*Chandax* in Persian and Arabic), which endowed the town with its Moslem name, which the Venetians changed to Candia. Candia replaced Gortyna, the former Byzantine capital, located in the hinterland. The decision by the Moslems to make a port town the capital of Crete shows the change of attitude towards the sea.[26]

During the Byzantine repossession of Crete from the tenth century, the island again became marginal to the main Aegean sea lanes. This affected the urban condition of the northern coast, which had a number of coastal settlements. Some, like Sitia in the east and Chania in the west, were fortified towns. Others, like Rethimon, were small villages. Moreover, the location of the capital of Crete on one hand, and the history of Candia on the other, during the two centuries after the Byzantine conquest, is obscure. It might be that Phocas, the Byzantine admiral who took Crete from the Arabs in 961, made the Castle of Temenos, which he built at the rear of Candia, the new administrative centre, since the fortress overlooked Candia and its bay. It was only in the

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[24]Christides, *Conquest,* 166 and 217-220; Pryor, *Geography, Technology and War*, 28; Pryor, "Mediterranean Round Ship," 60, 65-69 and 72-73; and F.M. Hocker, "Late Roman, Byzantine, and Islamic Galleys and Fleets," in Gardiner and Morrison (eds.), *Age of the Galley*, 94-97.

[25]Christides, *Conquest*, 116, 194 and map 3; and M. Lombard, *Espace et réseaux du haut Moyen Age* (Paris, 1972), 118.

[26]Christides, *Conquest*, 91; and Malamut, *Les iles*, I, 193-195 and 199-200.

twelfth century that Candia again became an administrative centre, when it replaced Knossos, 3.5 kilometres to the south, as the ecclesiastic metropolis of Crete. Most probably the choice of Candia was made to keep close contact by sea with Constantinople.[27] While various types of archeological remnants prove these contacts, there is no evidence that the Moslem port was maintained. Indeed, it may have been the opposite.

Historic documents and underwater archaeological evidence show that the sophisticated marine engineering skills of the Roman period in constructing artificial ports were lost in the eastern Mediterranean. This was proven by the ninth-century construction of another Moslem port, Acre, on the northern section of the Israeli coast. This port, probably like Candia, was built in the Byzantine tradition. Furthermore, one can safely speculate that without proper maintenance, Candia would have deteriorated, as did Acre.[28]

It should be pointed out that in the twelfth century Idrisi indicated the existence of several towns on the island, although he mentioned by name only Candia (Khandaq) and Chania. But he described Candia only as a fortified town, without any reference to a port, and Chania as a "Rabad al-Jubn" (a suburb of cheese). Nevertheless, despite the absence of artificial ports, the island thrived on maritime trade, in which the Venetians and the Genoese played active roles. Their ships, like the Byzantine vessels, must have anchored off the island of Dia, as did Phoca's fleet in the tenth century. A Byzantine *portolan*, added at the end of the catalogue of ships and equipment gathered for the expedition,

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[27]Malamut, *Les iles*, I, 194-197, 205-206 and 208; and Christides, *Conquest*, 179 and 181. D. Jacoby, "La colonisation militaire vénitienne de la Crete au XIIIe siècle: Une nouvelle approach," in M. Balard and A. Ducellier (eds.), *Le partage du monde. Echanges et colonisation dans la Méditerranée médiévale* (Paris, 1998), 300, claims arbitrarily, without any documentation, that Candia was also the administrative centre of late Byzantine Crete.

[28]R. Guillaed, "Les ports de Byzance sur la Propontide – I," *Byzantion*, XXIII (1953), 181-183. For the silted southern port of Tyre since the Byzantine period, see H. Frost, "Recent Observations on The Submerged Harbour Works of Tyre," *Bulletin du Musée de Beyrouth*, XXIV (1971), 103-111. For the early Moslem period onwards, see R. Gertwagen, *Crusader Caesarea – From a Port Town to a Coast* (Pairs, 1966), 555-559; and Gertwagen, "The Crusader Port of Acre," in I. Malkin and T.L. Hohlfelder (eds.), *Mediterranean Cities. Historical Perspective* (London, 1988), 555-559.

ignored Candia and its port, yet indicated that at the island of Dia there were two good havens.[29]

The two corsairs who, supported by the Genoese, held Crete between 1206 and 1217, also made the Gulf of Candia their maritime base and administrative centre. While they did not occupy the fortified city of Candia and its Moslem port, Pescatore built the castle of Paleocastro, near the Bay of Fraschea, at the northwestern end of the gulf of Candia. It is safe to argue that the shift of the administrative seat from the centre of the Gulf of Candia, and its separation from the site of the artificial port, was due to the port being inoperative. When Marcus Coranrius, the captain of two galleys and a *navis* arrived in 1217 from Constantinople with goods and the new Duke of Crete, he landed at Candia, from where he proceeded overland to capture Almanus in *portus* Fraschea. Since no artificial port was constructed at Fraschea during the medieval period, the term *portus* should be translated as a bay or a natural haven. Moreover, the term *portus,* especially with an artificial port like Candia was likely ignored deliberately.[30]

Occupying Crete, even if only to prevent the Venetians from holding it, as well as jeopardizing Venetian traffic in the vicinity, meant that both corsairs had to be physically present. The Bay of Fraschea, where their fleet anchored, was a proper substitute for an artificial port. Various medieval documents indicate it as the western natural harbour or haven (*scala*) bordering the Bay of Candia. The eastern *scala* was Prianguli, near the Karteros River. Modern pilot books describe the bay as a safe anchorage because of its adequate depth of water and natural protection against the prevailing north-northwest winds. As I will show later, these were the prominent disadvantages of the bay of Candia, where the derelict Moslem port, rebuilt and enlarged by the Venetians, was located. Furthermore, the corsairs' ships, with a hull design adapted for

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[29]H. Bresc and A. Nef (eds.), *Idrisi, La premiére géographie de l'Occident* (Paris, 1999), 349; Christides, *Conquest*, 178; and G. Huxley, "A Porphyrogenitan Portulan," *Greek Roman and Byzantine Studies,* XVII (1976), 298. For Venetian and Genoese trade in Crete, see Jacoby, "Byzantine Crete," 519-540. Nevertheless, Jacoby, "Creta e Venezia," 75-76, claims that Crete was only a marginal base for Venice until the Fourth Crusade.

[30]Borsari, *Il Dominio veneziano*, 21-24; Abulafia, "Henry Count of Malta;" Ortalli, "Venezia e Creta;" and "Andreae Danduli Chronica," in L.A. Muratori (ed.), *Rerum Italicarum Scriptores*, XII, No. 1 (1932), 288.

piratical raids, could easily have been pulled on shore. It is safe to argue that they found it unnecessary to invest time and money in maintaining the artificial port. On the other hand, having close contacts with the western Mediterranean, especially with the Genoese and the island of Malta, it would have expected that the corsairs would shift their centre of activity westwards. It is true that the shorter and convenient way to reach the western Mediterranean and the Ionian Sea was from Rethimon or Chania through Cerigo and Cerigotto. Yet such a route, as discussed above, was dangerous, especially for the shallow-draft vessels used by pirates. It is reasonable to conclude that Pescatore's and Costa's choice of the Gulf of Candia was due to its location on the sea lane leading north from Crete.[31]

The Venetian occupation brought about a new administrative division of the island in 1209 (this was confirmed in 1211). Crete was divided into four longitudinal districts; the four "capitals" were settlements along the northern coast. From west to east, these were Chania, Rethimon, Candia/Iraklion and Sitia. It should be emphasized that the Venetian government – the *signoria* – claimed the district of Candia and "remade" the fortified city of Candia as the administrative seat of the entire island.[32] It is not clear why, having expelled the corsairs from Crete, the *signoria* did not use Chania and its *portus*, the topography of which resembled an artificial port.

The port of Chania consists of western and eastern basins (see figure 3). The western basin is open to the north, and at present is protected only by quays. The eastern or Venetian basin was originally "built" with a ledge of rocks, running from a promontory in the east parallel to the shoreline. The modern mole/quay built over these rocks was first constructed in the fourteenth century. The natural topography resembled Jaffa on the Israeli shore. Indeed, the description of Jaffa by Ghilbert de Lannoy in the fifteenth century could have also applied to Chania before the fourteenth century: "Jaffa had a natural port built like an artificial" harbour. The sources show that on the eve of the Venetian occupation the ports of Chania and Iraklion shared two identical shortcomings: silting problems and the lack of proper moles to protect them from storms. But Chania enjoyed a tremendous advantage in that its natural

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[31]Thiriet, *La Romanie vénitienne*, 126; and *Mediterranean Pilot*, IV, 96

[32]Thiriet, *La Romanie vénitienne*, 125-126; and Jacoby, "La colonisation," 298-306.

rocks could be (and were) used both as a foundation and as the underwater level of construction. In another words, in Chania the mole served as a quay. The mole in Candia, on the other hand, had to be built as an underwater wall using more sophisticated and complicated techniques.[33]

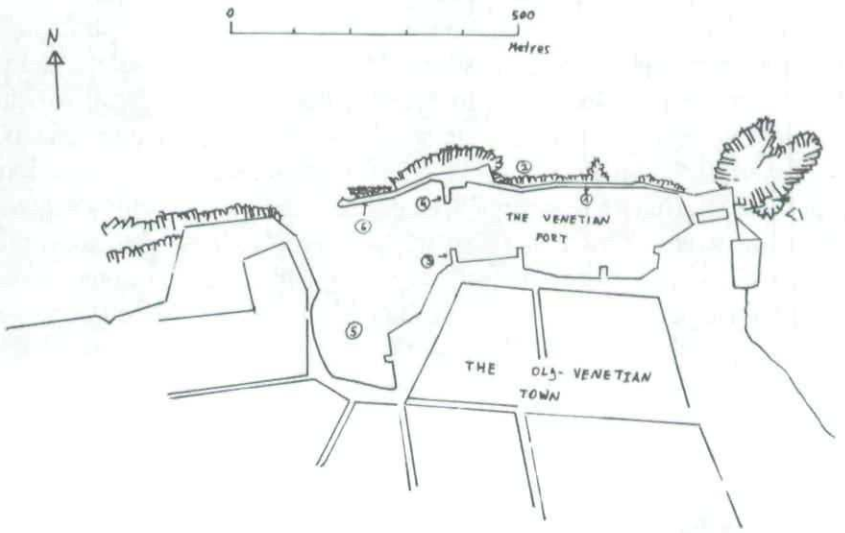

Figure 3: The Port of Chania – 1. The northern quay (built 1320s); 2. The ledge of rocks; 3. The southwestern mole (built 1389); 4. The northwestern mole (built 1419-1422); 5. The eastern natural basin.

Source: Heikel, *Greek Waters Pilot*, 338.

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[33]Ghillebert de Lannoy, *Voyages et ambassades*, in Ch. Schefer (ed.), *Le Voyage d'outremer de Bertrandon de la Broquière* (Paris, 1892), 99 and note 2. The Venetian Senate's decision of May 1302 on the construction of the port of Chania proved that the northern quay was built over the northern ledge of rocks. See Sp. Theotokis, *Istorikà kretikà éggraffa: Apophaseis Meizonos Symbouliou Venetias (1255-1669)* (2 vols., Athens, 1932-1933), I, 15-16 (8 May 1302). That decision also dealt with the silting problem (*ibid.*, 16, no. 8). Another instruction of August 1302 (*ibid.*, 19, no. 39) also dealt with construction and deepening. When referring to the maintenance of proper depth of water, the documents used the verbs *reparare* or *laborare*. The verb *facere* referred to the construction operation. There is a clear difference between quay, mole and breakwater; see Quinn, *Design*, 173, 189 and 241-242.

Chania's location facing the sea route to the north into the teeth of the prevailing winds was dangerous to Venetian and other vessels in the fourteenth and fifteenth centuries, despite improved hull designs and rigging. An instruction of the Venetian Senate on 19 April 1409, dealing with the transport of the Rector of Chania back to Venice, reiterated that as "our Chania is in such a location, it is well obvious to everybody that he [the Rector] cannot have transportation." The Rector therefore had to arrange to sail on a local ship to Modon, the next port of call for the merchant galleys which could supply passage to Venice. Unfortunately, he missed the convoy in Candia. The route in the other direction, however, could have been accomplished successfully while sailing with the prevailing winds. This might explain why Frederick II, who took this route on his way to the Levant in 1228, used the moderate morning winds, as mentioned above. After spending the night in the Bay of Sudha, in the centre of the northern coast of Crete, the fleet sailed towards Candia. But such a course was rare even for the larger vessels of the fourteenth and fifteenth centuries. An instructive example is the course taken by the sailing vessels that Nicholas de Martono sailed to the Levant in 1394 and Le Seigneur de Caumont travelled on in 1418. While the captains might have shortened their route by sailing directly from the northeastern coast of Sicily to Chania, they instead took the longer route that avoided Chania. The convoy with which de Martono sailed anchored in Milos, while de Caumont's vessel anchored off the island of Dia. The fleet of Friedrich the Second, however, anchored somewhere along the coast near Candia. The existence of an artificial port was again completely ignored. Instead, Frederick's historian wrote that "[w]e arrived at a certain town [Candia] of this island, near which we disembarked."[34]

On the basis of this evidence, it might appear that only Candia's strategic location led the *signoria* to claim it in 1209. While the aim to make Crete a permanent and flourishing colony undoubtedly motivated the *signoria*, especially after the expulsion of the two corsairs, to remake the Moslem city the capital and to rebuild the local port, the *portolan Il Compasso da Navigare* of the mid-thirteenth century ignored the artificial port of Candia, instead recommending anchorage off the island of Dia. In another words, the *signoria* took no steps to rebuild the port. Vessels

[34]ASV, Senato Misti-Secreta, reg. 48, f. 73r (19 April 1409); Huillard-Bréholles, *Historia Diplomatica*, I, book 2, 899; "Nicholai de Marthono, notarii," 581; and Grange (ed.), *Voyaige d'Oultremer*, 41-42.

anchored off Dia or in the Bay of Fraschea during bad weather. In calm conditions, they anchored opposite the sandy shore – the *sabbionara* or *ripa* of the documents – to the east of the artificial port, as a lease agreement for a small commercial *taride* in 1271 made clear. The sailors had to load the vessel from small boats.[35]

The Political Construct at the Time

The first instructions regarding the ports of Crete were issued only at the end of the thirteenth century. Candia was the first one dealt with by the *signoria* in 1290, when it was described as "completely devastated." These instructions were repeated in 1293, 1300 and 1303. The repetition suggests that they were not carried out the first time. From 1293 these instructions also included the port of Rethimon, and from the end of the decade Chania as well.[36] The long delay in addressing this topic likely was due to the unstable condition on the island combined with external events in the eastern Mediterranean which threatened Venice's position in Crete.

The seven decades that followed the expulsion of the corsairs were characterized by revolts of the local Byzantine inhabitants, or *autochtons*, stimulated by the Byzantines of Nicea, who invaded western Crete in 1230 and occupied Rethimon. The Bay of Sudha was their base. It was only because of the unfortunate wrecks of thirty Byzantine vessels on the way to Crete that the Venetians were able to expel the Byzantines in 1236. The *signoria* quelled the revolt by granting the magnates excessive privileges and settled Venetians in Rethimon. But no significant construction was carried out in the town or its port, undoubtedly because the *signoria*

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[35]R. Motzo, *Il Compasso da Navigare*, 55; and Thiriet, *Délibérations des assemblées vénitiennes concernant le Romanie* (2 vols., Paris, 1966), I, 40, no. 51. The *taride* was a small commercial vessel used in the coastal trade, propelled by oars and sails. See Villain-Gandossi, "Typologie," 57; and Balard, "Coastal Shipping," 133, 135 and 137.

[36]L.P. Spyridon, *Mnemia tes èllenikes istorias* (Athens, 1931), 29, no. 4; 33, no. 4; 47-48, no. 9; Theotokis, *Istorikà*, I, 3, no. 3 (1293?); 8, no. 15 (January 1300 [1301 by modern calculations; the Venetian year started in March]); 15-16 (8 May 1302); and 19 (23 August 1302); G. Gerola, *Monumenti Veneti nell'isola di Creta* (4 vols., Venezia, 1905), IV, 106, no. 5 (22 July 1300); and I, 85-86 (23 July 1300); and G. Giomo, *I Misti del Senato della Republica Veneta 1293-1331* (Amsterdam, 1970), 56 (April 1293 and March 1303).

lacked the funds for such operations. The establishment of Venetian hegemony over Crete, including the colonizers Venice sent to the island in 1211-1212, and to Rethimon and Chania in 1222 and 1233, exceeded its financial capabilities. Furthermore, the fact that only in 1252 did the *signoria* succeed in reconstructing Chania shows that there was no stability in the western section of Crete until that time. The Venetians built Chania as a town with an urban plan and peopled it with Venetian citizens. Yet no artificial port was mentioned.[37]

The Byzantine reconquest, supported by Genoa, of Constantinople in 1261 again endangered the Venetian position in Crete. The Byzantines usurped vast territories in the Aegean, including the islands of Zia, Periphos, Amorgos and Thera/Santorini to the north of Candia. Crete was promised to the Genoese once the Venetians were expelled. Nor surprisingly, these events stirred the *autochtones* on Crete to revolt again against Venice between 1264 and 1267. Moreover, Byzantine territorial acquisitions to the north enabled Venice's rivals to threaten its maritime links with the island and the southern Mediterranean. The letter Venice sent to the Pope in 1264 expressed fear of losing the island. On the surface, it appealed for a Crusade to recover the Latin Empire of Rome, "which was and is the strength of the faith of [Catholic] Christianity." But they also emphasized that "Crete was [also] the strength and stronghold of the Latin Empire" and deserved to be defended against the Byzantines. The inability of the *signoria* to do so was demonstrated by the Genoese attack on Chania in 1266 which destroyed the palace and a fortified tower; the defenders and the Venetian inhabitants were imprisoned.[38]

It was only the peace treaty between Venice and the Byzantium in 1268 that relieved the Genoese threat. The Emperor recognized Venice's

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[37]Borsari, *Il dominio veneziano*, 27-66; Ortalli, "Venezia e Creta," 22-25; Jacoby, "La colonisation," 299, notes, 7-8, and 303 and 308-311; Theotokis, *Istorikà*, I, 3, no. 3; and 8, no. 15. It should be pointed out that the instructions of 1293 dealt with the walls of Chania but not with its port. This instruction was repeated also in July 1300; see Gerola, *Monumenti*, I, 15, 100 and note 5. See also Malamut, *Les iles*, I, 196-197. On the first orders to build the port of Chania, see *ibid.*, 15. See also Thiriet, *La Romaie Vénitienne*, 97-99 and 137.

[38]Thiriet, *La Romanie vénitienne*, 139, 145 and note 4. Gallina, *Una società coloniale*, 2 and note 3, distorted the import of the letter to the Pope. For the attack on Chania, see L.T. Belgrano and Ch. Imperiale (eds.), *Annali Genovesi di Caffaro e de' suoi continuatori dal MCCLI al MCCLXXX* (Genoa, 1926), IV, 92.

hegemony over Crete, thus annulling his grant to the Genoese seven years earlier. The internal peace lasted only three years before a new revolt exploded in the eastern part of the island and spread to the west by 1279. During this rebellion the Venetians were expelled from the region of Sitia and the fertile valley of Messaria, south of Candia, while Candia itself was besieged. Only the renewal of the treaty in 1275 saved Venice from being forced to give up Crete. Yet as a response to the support of Venice by Charles of Anjou, the Latin pretender to the throne of Constantinople, the Byzantines encouraged the Cretan nobility to revolt again in 1281. This turmoil proved dangerous to Venice, especially once Genoa joined the hostilities. This Second Genoese War ended in 1299 with a Genoese victory near Curzola, on the Dalmatian coast in the Adriatic. The Byzantine Emperor supported Genoa and in 1295 abrogated the peace treaty with Venice. This situation further encouraged domestic violence on Crete. But a new peace treaty with Genoa in 1299 ensured Genoese neutrality in the continuing hostilities with the Byzantines. Without Genoese aid Byzantium was incompetent. This situation must have influenced the Cretan nobility to sign a peace treaty the same year with the *signoria* in return for a wide range of privileges. The war against the Byzantines was won only in 1302 when the Venetians regained the islands of Zia, Amorgos, Periphos and Thera/Santorini.[39]

It should be noted, however, that the wars in which Venice was involved did not interrupt its international trade in the eastern Mediterranean. Crete took an active part in this, despite the unsettled conditions before 1299. This activity was centred in Candia, the capital and main commercial centre. This was the reason for the Senate's order in 1290 to reconstruct this devastated port. Strong evidence for Candia's role in maritime commerce may be found in the *commerclum*, or import and export taxes. In July 1290 the Senate ordered the *signoria* to use tax revenues to reconstruct Candia's mole; to dredge the port; and to rebuild the houses on the town's main street. Three years later the *signoria* was ordered to use the *commerclum* to rebuild the mole at Rethimon, the walls of Chania and again for the port of Candia, which was still not restored. The *commerclum* was mentioned again in 1300, for Rethimon and Chania

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[39]Borsari, *Il dominio veneziano*, 61-64; Thiriet, *La Romanie vénitienne*, 149-155; and Ortalli, "Venezia e Creta," 17-18 and note 25. On the Second Genoese War, see Lane, *Venice, A Maritime Republic*, 82-85.

in July and for Candia in January. In another words, the reason for not building or maintaining the ports was not due to a lack of money.[40]

On the other hand, the problems with these ports did not obstruct Crete's role in international maritime activity. From 1300 Crete was an obligatory port of call for the convoys of Venetian merchant galleys going from Venice to Cyprus and Little Armenia. It was also a transhipment port for commodities brought to the island by privately-owned sailing vessels to be shipped to the Adriatic and Venice in the merchant convoys. The Notary Acts of 1300 clearly show that Crete was frequented by non-Venetian traders from all over the Mediterranean, many of whom made Candia/Iraklion their place of residence. The *portus of Candia,* where a *taride* anchored in February 1300, was applied to the whole Bay of Iraklion, from the haven of Frashea in the northwest to the island of Dia in the northeast. As it was winter, the *taride* must have anchored in one of these sites rather than in the open bay. Small boats handled the cargo. The boats must have belonged to local residents, who likely tried to take advantage of the impossibility of anchoring inside the artificial port to avoid paying the *commerclum*, which since 1298-1299 had been listed in the registries of the coast gates (*ordo ripe maris*), and to engage in smuggling along the coast, *sabionara* or *ripa* in the east. In November 1317, the *signoria* issued the owners of these boats strict orders to enter the artificial port and to report to the local officials. Those boats had shallow drafts and could have been pulled on shore. The official in charge was the Admiral, a post created in Candia since at least 1302.[41]

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[40]The problem had to do with the refusal of the local inhabitants to collaborate and contribute their expertise and the manpower. On port maintenance and construction, see R. Cessi, *Deliberazioni del Maggior Consiglio* (3 vols., Bologna, 1934), III, 269, no. 60; and 346, no. 80. "*In apatione moli et portus*" means to excavate the bottom. See above notes 32 and 33.

[41]Thotokis, *Istorikà*, I, 8-11, nos. 17, 22 and 23; R. Cessi and P. Sambin, *Le Deliberazioni del Consiglio dei Rogati, Serie "Mixtorium"* (Venice, 1960), I, 17-18, no. 71; 21-22, no. 82; 40, no. 140; and *passim*; S. Carbone (ed.), *Pietro Pizzolo, notaio in Candia, 1300* (Venice, 1978), 18-19, no. 25; 33-34, no. 27; 37, no. 60; 39, no. 73; and 63-64, no. 129; R. Morrozzo della Rocca (ed.), *Benvenuto de Brixiano, Notario in Candia (1300-1302)* (Venice, 1950), 104-105, no. 285; and 107-108, nos. 287-288; D. Jacoby, "Cretan Cheese: A Neglected Aspect of Venetian Medieval Trade," in Ellen E. Kittel and Thomas F. Madden (eds.), *Medieval and Renaissance Venice* (Urbana, 1999), 49-68; R.P. Vidulich, *Duca di Candia, Bandi (1313-1329)* (Venice, 1965), 63; and Thiriet, *Délibérations des assemblées vénitiennes concernant la Romanie,* I, 93.

One would have expected that once they consolidated their control over Crete the Venetians would have built artificial ports. But several events clouded the atmosphere in Crete for almost thirty years in the fourteenth century. First, there was the revolt of the Greek *autochotnes* around Sitia and Chania, which culminated in an alliance with the Venetian colonists to oppose the *signoria* between 1342 and 1348. Second was the Black Death, which swept the island in 1347-1348. Finally, there was the great mutiny by the Venetian colonists between 1363 and 1369. The major reasons for the revolts were increasing fiscal demands and restrictions that Venice, a centralist Empire, imposed on Crete. Aside from these events, the island enjoyed long periods of peace during the fourteenth and fifteenth centuries, which allowed increasing agricultural production and the export of wheat, wine, cheese, sugar, cotton and salt, primarily to Venice.[42]

Venetian Criteria for the Construction and Maintenance of Ports

Eighty percent of the Venetian documents about the construction and maintenance of ports in Crete deal with Candia. This is striking evidence for the concern the authorities invested in this port, in contrast to Rethimon and Chania. As the port serving the capital, Candia enjoyed special treatment.

The Port of Candia/Iraklion

In September 1302, on the eve of the peace treaty with Byzantium, the Venetian Senate authorized Treasury officials in Crete to provide funds to reconstruct the mole in the port of Candia. In March 1303, the Senate ordered the port to be enlarged and modernized. In the 1320s Venice became more directly involved in the organization, construction and maintenance of the port. As Ennio Concina notes, there was a direct connection between the work carried out in Candia and other Venetian colonies in the Aegean and the enlargement of the Metropolitan arsenal and the major work in the first half of the fourteenth century on the Venetian lagoon. From the 1320s, the Arsenal provided the colonies with

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[42]Thiriet, "Sui dissidi," 701-711; Thiriet, *La Romanie vénitienne*, 316-324; Gallina, *Una società coloniale*, 37, note 10, and 127-137; Jacoby, "Creta e Venezia," 79-80 and 90-91; and Jacoby, "Cretan Cheese," 49-68.

the equipment and materials needed for all kinds of work. In the case of Candia, this first meant the establishment of the office of chief carpenter (*proto-maragnorum*) in 1322. Initially this office was held by the same individual who served as Admiral (*Admiratus*); this professional was given the title *magister*. As the Admiral, he controlled port administration; as chief carpenter, he was in charge of the material sent from Venice and the chief shipbuilder working in the Candiot arsenal. In 1333 Venice sent to Candia Francesco delle Barche, an engineer and member of the professional staff of the Arsenal in Venice, who was known as the inventor of the mechanical shovels used to dredge the bottom of the Venetian lagoon. He was sent to inspect the port of Candia and to recommend the work that needed to be done and the type of equipment required.[43] This evidence supports the argument that before this the Venetians relied on local skills. As I will show later, all the engineers who worked in Candia during the fourteenth and fifteenth centuries were sent from Venice. Chania and Rethimon, on the other hand, were discriminated against.

The Port of Chania

On 5 May 1302, the Rector of Chania sent several demands to the Venetian Senate for improving the town's condition. By this time Chania was almost totally devoid of people due to the wars and the lack of an artificial port, which made anchoring near the town dangerous and led all commercial activities, including the markets, shops and taverns, to locate outside the town. The Rector therefore demanded money that had been promised previously to build the northern quay. To deepen the harbour, he suggested using taxes levied on Jews living in the region.[44]

Unfortunately, the Rector did not mention the source of the money promised by Venice. It might, however, have come from Candia's *commerclum*, which also had to fund, according to a Senate instruction in

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[43]Spyridon, *Mnemia*, 16 (12 September 1302); Giomo, *I Misti*, 56 (March 1302) and 62 (March 1322); and E. Concina, *L'arsenale della republica di Venezia* (Milan, 1984), 34-36. Concina ignored the establishment of the office of chief carpenter in Candia in 1322. See also Theotokis, *Istorikà*, I, 120, no. 5. On Francesco delle Barche, see B. Cecchetti, *La Vita dei Veneziani nel 1300* (2 vols., Bologna, 1980), I, 58.

[44]G.M. Thomas, *Diplomatarium Veneto-Levantinum sive acta et diplomata* (2 vols., New York, 1880), I, 3-4, no. 3 (8 May 1302).

1300, the construction of the walls of Chania and the mole in Rethimon. In another words, the port of Chania was included among the public works to be financially supported by the Cretan treasury. It is thus possible that the political instability before 1302 had prevented the money from reaching its destination. On the other hand, it is also possible that the denial of the money was part of a general scheme. For example, the *signoria* did support, as it should have, the inhabitants of Chania whose houses were destroyed during the war. On the other hand, it deliberately withheld pay from some members of the militia of Chania who fought for Venice during the hostilities, an act which might have caused bitterness among the enlisted men and problems for the future. The following request of the Rector, included in this letter, is thus of great interest. He demanded that wheat, olive oil and wax, three local products exported to Venice via Candia, be treated equally whether they were produced in Chania or Candia. He further requested that, where appropriate, shipments be allowed directly from Chania. Since it was impossible to anchor in the local port, the Rector suggested using the Bay of Sudha. Chania undoubtedly lost revenue on goods exported through Candia because of the *commerclum* levied by the *signoria*. A privilege accorded Chania in 1356 by the Venetian Senate to export all kinds of commodities from the port, except the three products above, shows that all of Chania's exports previously had gone through the port of Candia. In other words, the *signoria* had a deliberate policy to concentrate maritime activities in the port of Candia. In this way it maintained its tax yield, which was also a major source of funds also for the construction and maintenance of ports. The distribution of this money determined the existence of the other ports. It appears that the *signoria* used practical means to ensure the supremacy of Candia, as the following evidence suggests.[45]

Despite this plea, Chania did not get the money needed to construct the quay. In 1317 the issue was revisited, and the Senate ordered the *signoria* to give the Rector of Chania half the 4000 *hyperpera* sent to Crete from Venice. Another instruction in 1320 ordered that Chania be given funds to build the quay. But the *signoria* remained obstructionist and succeeded in cutting the sum in half. Although the quay was built, the depopulation of Chania because of the absence of a full artificial port

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[45]Thiriet, *Régestes des délibérations du sénat de Venise concernant la Raomnie* (3 vols., Paris, 1958-1961), I, 84, no. 305.

continued until Chania won the right in 1356 to export directly to Venice. Tied to this privilege was a promise to dredge the port, since an adequate depth of water was essential. After 1356, revenues from maritime commerce had to fund maintenance in the port.[46]

A decision in the Venetian Senate in July 1360 is also indicative of the problems. The Senate denied the request of the Rector of Chania to contribute to the manpower of the Venetian naval force. The request was that the contribution include mariners, warriors and captains, as Candia provided, although in lesser numbers. The Rector was proposing that when Crete had to provide manning for three war galleys, Chania would take care of the third one, under the same conditions as Candia. During the 1350s Venice was fighting both the Genoese and the Turks. In this context, the Rector's request was relevant if not generous. On the other hand, it also reflected a political motive, since the shouldering of duties implied certain rights, in this case the right to a certain independence in managing Chania and its port. In declining the offer, the Senate claimed that granting such a privilege might have exacerbated tensions between the *signoria* and Venice, a situation which eventually ended in the mutiny of 1363. These tensions were therefore not imaginary. For example, in October 1360 the *signoria* asked the Senate to laud Candia's efforts to arm war galleys for the Venetian navy; coming just three months after the Senate had turned down Chania's request, this was clearly not accidental. Indeed, it is a fair deduction that the Venetian Senate was forced to support the *signoria*'s policy. But Chania did not give up. In 1416 the Rector offered, unsuccessfully, that Chania and Rethimon man the third galley in rotation. This rejection was cancelled in 1467, however, because of increasing efforts to block the advance of the Ottoman Turks into the Aegean. In August 1467, Chania and Rethimon were ordered to man two *trirémes* each, and each port was provided with two new arsenals.[47]

In 1387 the Rector of Chania applied to the Venetian Senate for permission to construct a mole at the western entrance to the port. He

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[46]Theotokis, *Istorikà*, I, 67, no. 7; and 73, no. 4; and II, 35-40, no. 12; and Vidulich, *Duca di Candia*, 13-16, no. 21 (21 April 1314), and 24, no. 304 (22 January 1319).

[47]Theotokis, *Istorikà*, I, 76-78, no. 13 (21 July 1360), and 79, no. 15; and H. Noiret, *Documents inédits pour servir a l'histoire de la domination vénitienne en Crete de 1380 a 1485* (Paris, 1892), 247-248 (26 August 1416) and 504 (15 August 1467).

mentioned two essential motives. The first was to enable safe anchorage for all type of vessels. The second motive was to ensure protection against attacks from the sea. The Rector gave the Senate the circumference of the port of Chania - 562 *passi veneziani* (983.88m) - *and* indicated that it required 600 soldiers for protection. Stationing troops permanently might have been much more expensive than enclosing the port with moles.[48]

The Rector demonstrated well the security problems of a town with an unprotected port. It might, for example, become a landing place for maritime invaders. Indeed, Chania had a long record of attacks, such as the one by Genoa in 1266. During the Third Genoese War (1351-1355) the fear of a similar attack led the Rector to destroy buildings in the exposed *burgus* outside the city walls to deprive invaders of hiding places. It was no coincidence that just after this conflict the Venetian Senate finally granted Chania's request to dredge the port. Moreover, Chania was surrounded by a fertile area that produced many important products, including wheat, salt, cheese and wood. The last was especially important for shipbuilding. According to Lombard the forests around Chania, including the White Mountains, made Crete the major Moslem power in the Mediterranean in the ninth and tenth centuries. One inhabitant boasted to Buondlemonti in 1418 that foreign merchants used to come to Chania to load their vessels with cypress wood, a precious product that might well have tempted Venice's enemies to invade.[49]

If this strategic argument made sense in 1356, how can one explain its reiteration in 1387? It was undoubtedly because new needs, like the construction of moles, required more funds and materials. Given its record, the *signoria* might have tried to obstruct this - and the Senate might have backed it. Such possibilities required Chania to stress its strongest argument, which was the one involving security. And it worked:

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[48]Noiret, *Documents*, 16-17 (31 July 1387). For the impact of winds and waves on Chania, see *Mediterranean Pilot*, IV, 83; and R. Heikel, *Greek Waters Pilot* (4th ed., London, 1990), 38. For the metric equivalent for *passi veneziani*, see note 57. The problems of maintenance of this port are discussed in R. Gertwagen, "L'isola di Creta e suoi porti (dalla fine del XII secolo ala fine del XV secolo)," in Ortalli (ed.), *Venezia e Crete*, 366 and 369-370.

[49]Theotokis, *Istorikà*, II, 34, no. 30; and 39, no. 12; Lane, *Venice, A Maritime Republic*, 174-179; Thiriet, *La Romanie vénitienne*, 39, 319, 321-324 and 329. Noiret, *Documents*, 56 (9 July 1394); ASV, Duca di Candia, Lettere Ricevute, B1, No. 6, f. 11r (6 November 1415); Lombard, *Espace et réseaux*; and Buondelmonti, *Descriptio*, 136.

the mole was partially built in 1389. But when later experience showed that this partial mole was insufficient, a later Rector of Chania raised both arguments anew in a letter to the Venetian Senate in August 1416. Yet this time the marine engineering and safety problems received greater emphasis. As a result of the poor state of the port, two *cogs* loaded with wheat were wrecked trying to clear in January. The Rector's letter stressed that the existence of a protected port in working condition was vital to increase the population and wealth of Chania. The letter also implied that denuding such a strategic area of loyal inhabitants might facilitate an invasion and endanger Venetian dominion in Crete. Indeed, earlier that year such a danger seemed about to eventuate. The Rector wrote the *signoria* in March 1416 that Ottoman ships tried to invade the Bay of Kissamos, west of Chania, but fortunately were shipwrecked at the island of Gramboussa, northwest of this bay. The shoreline of the Bay of Kissamos had few residents, since most had emigrated to Candia. When the Senate discussed the danger it ordered the new Duke of Crete to inspect the port with the Rector as soon as possible. The source of the funds required for the works was to be the fines paid by the Venetian citizens of Chania who broke the law.[50]

The procedure ordered by the Senate took three years, and the works were carried out between 1419 and 1422. But they did not meet the stated goals. Northerly winds still affected the anchorage and silting continued, mainly at the entrance. The Senate ordered the extension of one of the western moles and continued dredging, although it also specified that costs be kept to a minimum.[51]

A new discussion in the Venetian Senate in November 1452 reveals that the previous order was never carried out, perhaps because the *signoria* again obstructed it. This time, however, the Senate ordered the *signoria* to send Chania its engineer (*protomagister*) and two or three other experts. All were to inspect the port and to decide about the work to be done. The manpower was to come from imprisoned debtors and was to be supplemented, if necessary, by labour hired using the incomes from

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[50]ASV, Senato Misti-Secreta, reg. 41, f. 18v (18 June 1389); Duca di Candia, B1, No. 4, f. 21v (31 December 1415); and f. 30r (18 March 1416); Noiret, *Documents*, 56 (9 July 1394); and I. Friel, "The Cogs, the Cocha and the Carrack," in Gardiner and Unger (eds.), *Cogs, Caravels and Galleons*, 78-79.

[51]Noiret, *Documents*, 296 (2 July 1423).

lawsuits.[52] The increased Ottoman threat was likely behind this new concern for Chania. This was prudent, for early in 1453 the Ottomans conquered Constantinople.

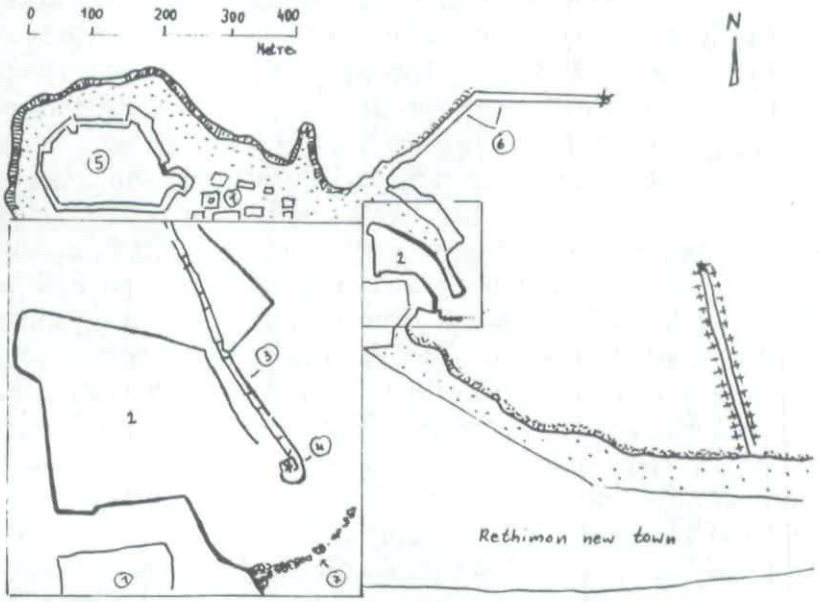

Figure 4: The Port of Rethimon – 1. The old Venetian town; 2. The Venetian port; 3. The northern old mole built over the medieval one (constructed in the 1290s); 4. Ottoman lighthouse; 5. Venetian castle (built in the 15th century); 6. Moder moles and quays; 7. Modern breakwater

Source: Heikel, *Greek Waters Pilot*, 340.

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[52] *Ibid.*, 438-439 (11 November 1452). The extension was carried out after 1458; see ASV, Senato Mar, reg. 6, f. 63v, 20 March 1458. Neither western mole protected the port against the northerlies, and eventually the northern quay was extended westwards in 1549; see Gerola, *Monumenti*, IV, 100 and note 10.

The Port of Rethimon

Rethimon and its port are located east of the Bay of Sudha. The Venetian port is located at the southwestern end of the modern one (see figure 4). The northern mole had already been built by the thirteenth century, very likely by local workers. Venetian documents refer to its reconstruction, undoubtedly again by locals, in 1293 and 1300. But Venetian records then ignore the port until 27 June 1383, when the Senate discussed its poor condition, noting that the mole was in ruins and the anchorage zone suffering from heavy silting. Eventually the *griperae* and other *navigia* had to move to Candia for anchorage. The reason for this long neglect is unknown. One could claim that the Senate did not realize a direct connection between a port that was not in working order and the existence of maritime commerce. Eventually, although the port remained neglected, Venice in July 1359 accorded Rethimon a privilege, which allowed citizens to export all kinds of commodities, except the monopolies such as wheat. It is tempting to speculate that the *signoria* was behind the neglect to force the inhabitants to use the port of Candia. Regardless, in June 1383 the Senate ordered the *signoria* to send to Rethimon the materials needed to reconstruct the mole. At the same time, it emphasized that the local people had to pay the port's operating costs. A new discussion in the Senate in December 1386 shows that nothing had been done because of a lack of funds; it seems that the *signoria*'s obstructionist proclivities died hard. The Senate, however, ordered the Jews of Rethimon to contribute a sum of money in return for permission to build a synagogue. After this sum had been spent, the Rector could use a specific annual sum from the taxes due Venice. Documents of August 1392, October 1393, and February and March 1398 show that lack of money continued to be a problem. In November 1414 the Senate ordered the *signoria* to keep in a special safe Venice's share of taxes. But the safe was empty and the *signoria* did not fulfil its obligation.[53]

The 1414 instructions marked a turning point. Prior to that date, local citizens like Dimitrius Naxioti, a trusty of Venice, volunteered to

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[53]Theotokis, *Istorikà*, II, 69, no. 1 (4 July 1359); and 246, no. 19; Gertwagen, "L'isola di Creta," 364-365; Noiret, *Documents*, 91-92 (11 February 1398) and 231-232 (6 November 1424); and ASV, Senato Misti-Secreta, reg. 40, f, 56r (11 December 1386); reg. 42, f. 72v (9 August 1392); f. 137v (16 October 1393); and reg. 44, f. 34v (1 March 1398).

"aptare et reparae portus." But in November 1414 the Senate ordered the *signoria* to send to Rethimon Johannes de Bunis, along with three others skilled in engineering, to inspect the port of Rethimon and to determine if the works required by the local Rector were operative. The Senate raised the sum of money to be invested, and offered to contribute half. It almost certianly was the Rector's claim that a silted and unprotected port harmed the local inhabitants that led the Senate to change its attitude. The Rector further warned that if the port was not maintained properly, the inhabitants might leave Rethimon. It should be pointed out that this argument was repeated to gain permission to construct the southeastern mole. Further, the Rector indicated the lack of a proper port in working condition was forcing local shipowners to abandon Rethimon.[54]

Like Chania, the hinterland of Rethimon was very fertile and produced four monopoly products: wheat, sugar, salt and wood. Moreover, Rethimon occupied a strategic site at the west of Sudha Bay, which was the best *portus* in Crete. If Rethimon had been depopulated, it might have facilitated an invading force that could have made Sudha its base. As with Chania, the economic and strategic importance of Rethimon led the Venetians to counter an Ottoman threat by investing to keep the local port in working condition. This explains why only one year after the fall of Constantinople the Venetian Senate in October 1454 accorded Rethimon the privilege of a permanent engineer sent from Venice.[55]

Still, it is striking that no artificial port was built in the Venetian period along the entire eastern section of the north coast of Crete, between Iraklion and Cape Sidhero, or even at Sitia, the administrative centre for this area. Since the beginning of the fourteenth century Sitia had been constantly attacked by the Turks of Asia Minor. In the beginning they collaborated with the Catalans, and during the 1350s they operated independently. The *signoria* only provided Sitia with troops, a defense that

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[54]Noiret, *Documents*, 91-92 (11 February 1398) and 303 (18 November 1424); ASV, Senato Misti-Secreta, reg. 44, f. 34v (1 March 1398); reg. 49, f. 135v (10 September 1412); and reg. 57, f. 234v (15 July 1430).

[55]Thiriet, "Rethimo et son district au quinzieme siècle," in Thiriet, *Etude sur la Romanie greco-vénitienne*, 300; D. Jacoby, "La production du sucre en Crète vénitienne. L'Echec d'une entreprise économique," in Jacoby, *Trade, Commodities and Shipping in the Medieval Mediterranean* (Aldershot, 1997), 167-180; ASV, Senato Misti-Secreta, reg. 53, f. 158r (18 November 1423); and reg. 5, f. 61r (1 October 1454); and Duca di Candia, Lettere Ricevute, B1, No. 10, ff. 49v-50r (18 November 1423).

proved useless. Even the desertion of Sitia and the villages in the hinterland did not lead the *signoria* or the Senate to construct an artificial port. While it is true that Sitia's hinterland was not as rich as some other areas on the island, the constant attacks prevented the proper cultivation of what could be grown. To make matters worse, the Rector of Sitia did not push the issue with the Senate.[56]

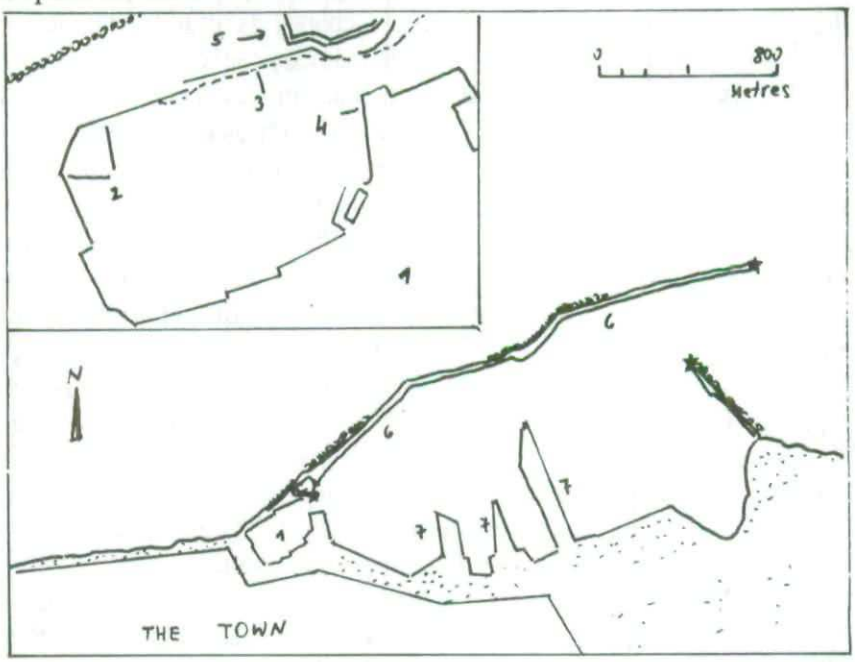

Figure 5: The Port of Candia – 1. The Venetian port; 2. The Moslem northern mole rebuilt by Francesco delle Barche and in modern period; 3. The extension irst made by Francesco delle Barche; 4. A modern quay built over the fourteenth-century breakwater rebuilt into a mole in the fifteenth century; 5. The Venetian maritime castle of the sixteenth century, replacing the maritime tower of the fourteenth century; 6. Modern northern mole; 7. Modern finger quays.

Source: Heikel, *Greek Waters Pilot*, 342.

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[56]Thiriet, *Délibérations des assemblées vénitiennes concernant la Romanie*, I, 222-223; Thomas, *Diplomatarium*, I, 107-110; Vidulich, *Duca di Candia*, 148-151 and 153-155; Noiret, *Documents*, 520-521 (11 October 1471); and Gallina, *Una Società Coloniale*, 22 and 27.

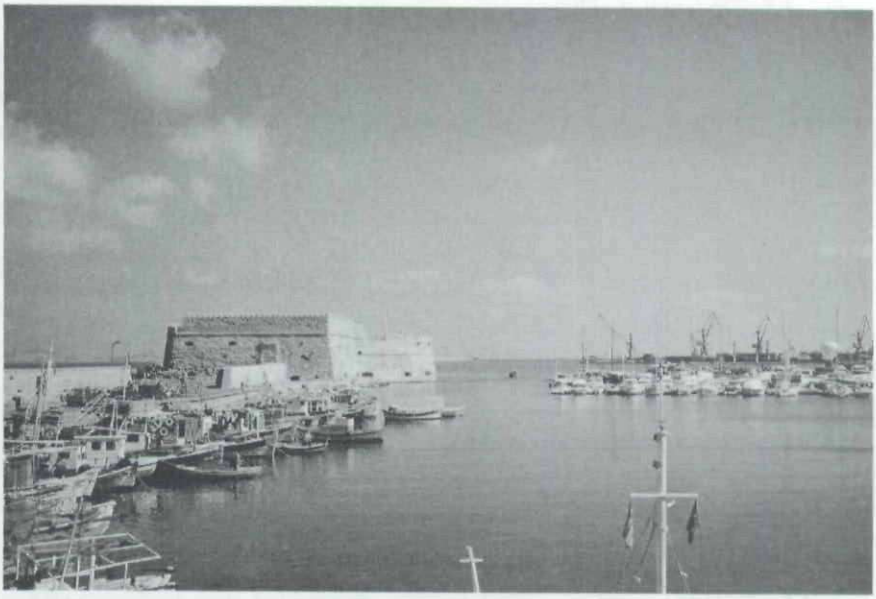

Figure 6: Entrance to the Venetian port of Candia towards the east, with the sixteenth-century Venetian maritime Castle.

Source: Courtesy of the author.

The Port of Candia – Problems of Maintenance

The medieval port of Candia lies in a small bay at the eastern extremity of the larger Bay of Candia, which is bordered at its northwestern end by the Bay of Fraschea and on the east by the anchorage *(scala)* of Prianguli, near the Karteros River. The present fishing and yacht harbour is constructed on the site of the medieval port. A long mole runs from the southwest to the northeastern side of the small bay, parallel and contiguous to an ancient one, which ends at a castle. The length of the ancient mole was 270 metres. There is another mole, also based on an ancient structure, which runs in a northwest direction. This is the inner anchorage (the Venetian port) with a sixty-metre-wide entrance (see figures 5 and 6).

Less than 500 metres to the west of the present port, adjacent to the ancient city wall, there is another bay, depicted in the various historic plans describing Candia in the sixteenth and seventeenth centuries. Until the mid-seventeenth century, this bay was at the mouth of the Dermata River, which cannot be traced today. Its name is derived from the leather industry, handled by the Jews at the time, which was situated in that area.

From proclamations issued in the fourteenth century, we know that this bay provided anchorage for small boats. Deramta Bay and the Bay of Candia are former estuaries of the Dermata and Cacinava rivers. When the sea level rose, from the Roman era onwards, sand brought in by the waves silted up the two bays. This sand brought about the formation of the sandy shore or *sabbionara* east of Candia and the sand bar *(sacha)* at the western side of the port. The site of ports depended primarily on maritime conditions. A number of topographic and maritime factors were of primary importance: protection against prevailing stormy winds; adequate depth of water; and protection against waves, which could silt the port. The reports of Venetian engineers, starting with Francesco delle Barche, shed light on problems of marine engineering relevant to the maintenance of the port of Candia. The builders of the Moslem port, as well as the Venetians, tried to overcome similar problems. The first was to protect against the stormy north-northwest winds prevailing in the Aegean. Buondelmonti indicated in 1418 that during strong winds access to the port of Candia was very difficult. The location of the old mole proves that its builders in the Moslem period were aware of these dangerous winds. The old mole borders the western side of the small bay and is built on a southwest/northeast axis, from La Torre del Castello, the tower built in the northwestern corner of the city. According to Francesco, the mole failed to provide proper protection. He therefore ordered it extended to the northeast in a semi-circle by fifteen *passi veneziani* (26.1 metres). Facing this mole he ordered a breakwater to be built on a northwest axis, eighty *passi veneziani* (139.2 metres) in length, to enhance the protection of the anchorage area against the northerlies.[57]

This evidence strongly suggests that the artificial port of Candia, from the ninth century until the completion of Francesco's project in the mid-fourteenth century, could not provide protection against strong winds. A pirate ship chased a Genoese *lignum* loaded with slaves bound from Constantinople to Egypt in February 1304. Eventually the Genoese made a detour. Instead of sailing along the Aegean coast of Anatolia, they reached the *portus* of Candia in a storm. The captain undoubtedly anchored in the island of Dia or the Bay of Fraschea rather than inside the

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[57]Gertwagen, "L'isola di Creta;" *Mediterranean Pilot,* IV, 16; Buondelmonti, *Descriptio*, 146 and 150-151; and Theotokis, *Istorikà*, I, 22, no. 33. The metric equivalent of *passi veneziani* follows Thiriet's calculation of 1 *passus*= 5 pieds vénitiens = 1.74 metres. Thiriet, *Régestes*, I, 228.

old mole. Similarly, the discussion in the Venetian Senate in 1357 to extend the northern mole another ten *passi veneziani* (17.4 metres) eastward suggests that even Francesco's measures were insufficient. Indeed, it was only in the twentieth century that the northern mole was extended sufficiently. According to Pietro Casola, who visited the port in 1494 on a pilgrim galley, the northerly *(bora)* blew so hard that it dashed the anchoring ships inside the port against each other. Moreover, the unstable construction of the northern mole finally led to its collapse.[58]

The Mole and the Breakwater – The Construction Technique

When he extended the Moslem mole to the northeast, Francesco delle Barche followed one of the construction techniques used in the Venetian lagoon: putting stones in wooden caissons without the addition of any concrete. In the case of the mole at Candia, these were ashlar stones quarried on the island of Standea/Dia, north of Candia. But the technicalities of sinking these stones are not described. The instructions of the Venetian Senate in February 1335, July 1337, February 1340 and September 1342 dealing with the funding of construction in Candia prove that they had not been done before the early 1340s. In fact, it is likely that the mutiny of 1342 and the Black Death epidemic in 1347-1348 prevented Francesco's project from being completed until the end of the 1340s.[59]

The construction method he ordered had two shortcomings that caused the collapse of the underwater foundations both in Venice and Candia. First, he did not use hydraulic concrete based on lava ash or volcanic sand, generally known as *pozzolana*. The method of building underwater moles, described in detail by Vitruvius in 25 BC, was first employed by the Roman engineers on a large scale in the outer basin of

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[58]Thomas, *Diplomatarium*, I, 23-24, no. 12; Theotokis, *Istorikà*, II, 23-24, no. 8; 51, no. 4; 160, no. 6; and 186-187, no. 42; and *Canon Pietro Casola's Pilgrimage to Jerusalem in the Year 1494* (Manchester, 1907), 316.

[59]Francesco used the verb *gettare* with regard to the ashlar stones used in the construction of the mole at Candia; see Theotokis, *Istorikà*, I, 121-122; 166-167, nos. 17-18; 173, no. 33; and 203, no. 22. On strengthening the shores of the Venetian lagoon, see ASV, Senato Mist-Secreta, reg. 28, f. 27 (4 April 1359); and reg. 53, f. 136v (15 May 1421); and Provveditori del Collegio *de Sal*, R. 3, B. 6, f. 21r, 15 May 1421. For the various methods used in Venice, see M.F. Tiepolo, "Difesa a mare," in *Mostra storica della laguna veneta* (Venice, 1970), 133-138.

the port of Caesarea Maritima (circa 22-15 BC) along the Israeli shoreline. For the port of Caesarea, the *pozzolna* was imported from western Italy. This method was also employed in the ports of Paphos in Cyprus and Chersoninsos in Crete, the latter of which lies only twenty-five kilometres east of Iraklion. But this technique was no longer used in the eastern Mediterranean because of a lack of suitable expertise. The construction of the northern mole at Caesarea Maritima by Anastasius I (502 BC), two made-man ports in Constantinople by Justinianus (554 BC), and the eastern mole at Acre in the ninth century prove this point. Instead, the technique used in these ports involved filling caissons with stones and cement based on lime. High-calcium limes are not hydraulic even when slaked by water. When the lime decomposed and the caissons disintegrated, the moles collapsed. On Crete, this probably is the type of construction used in the northern moles in Candia and Rethimon. An additional shortcoming was the absence of rubble as a foundation for the moles and a means to strengthen and stabilize the sea floor. This device should have been used to prevent the waves from sweeping away the sand under the moles, causing the collapse of the whole structure. No rubble foundation was mentioned for the moles of the ports near Constantinople or in the case of the eastern mole at Acre. Undoubtedly the builders of the Moslem mole at Candia made the same mistake. Not maintained until the thirteenth century, the Venetians found it in horrible condition.[60]

It seems safe to speculate that the techniques used by Francesco delle Barche and the other Venetian engineers for building underwater facilities were the same ones employed on Crete for hundreds of years. At the port of Candia, however, the Venetians used a variant of a Roman technique, which was later adapted in Chania and Rethimon. In the Claudian port of Ostia a huge merchant ship was used as a caisson for the core of the underwater foundations of the lighthouse, made with hydraulic concrete. Similarly, some smaller ships were used for the mole of this

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[60]Ch. Branton, "Cement, Concrete and Setting Barges at Sebastos. Comparison with Other Roman Examples and Descriptions of Vitruvius," in A. Raban and K.G. Holum (eds.), *Caesarea Maritima. A Retrospective after Two Millennia* (Leiden, 1966), 25-40; R.L. Holfelder, "Caesarea's Master Harbor Builders: Lessons Learned, Lessons Applied?," in *ibid.*, 94-101; L. Leatham and S. Hood, "Submarine Exploration in Crete," *Annual of the British School at Athens* (1958), 267-268; R. Gertwagen, "The Venetian Port of Candia, Crete (1299-1363): Construction and Maintenance," in Malkin and Hohlfelder (eds.), *Mediterranean Cities*, 141-158; Gertwagen, "Crusader Port of Acre," 555-558; and R. Davey, *A History of Building Materials* (London, 1961), 97-101.

port. The Venetians also employed an old merchant ship filled with stones when repairing the Candia mole in 1374, but again without the addition of concrete and with no rubble foundations[152]. Ten years later, the Rector of Chania asked the Venetian Senate to send cog and a great galley for the construction of the northwestern mole. Three years later the Senate ordered two cogs to be sent, to be sunk underwater full of stones, one at the head of the other. In 1389 an old broken galley, cast on the seashore at Chania, was used to build the southwestern mole. To build the northwestern mole at Chania, the Senate in 1423 ordered the use of an old *navis* of between 180 and 240. This operation was finally carried out in 1452 by the Venetian engineer in Candia. It is significant that the engineer used the Latin noun gettum, derived from the Latin verb *gettare,* used by Franchesco delle Barche for the construction of the northern mole at Candia. It seems reasonable to conclude that the modern moles enclosing the eastern inner port of Chania are therefore built on old foundations. In the Venetian period, however, no concrete was added to the stones filling the ships, which were sunk right on the bottom without a rubble foundation. Skilled *autochtones* used the same technique to construct the northern mole at Rethimon, in 1383 sinking a large sailing vessel full of stones, without hydraulic concrete or a rubble foundation.[61]

No doubt these faults facilitated the breakdown of the different types of moles in Cretan ports. The northern mole at Rethimon required strengthening only three years after its construction. As for the moles enclosing the entrance to the port of Chania, the Venetian Senate ordered in 1423 that "it is necessary to claim and watch over the repairs, from time to time, the *gettum* which was done in this port, so it would not fall apart." As for the mole in Candia, Venetian documents point to constant repairs in the fourteenth and fifteenth centuries. The Venetian idea to overcome the absence of a rubble foundation under the mole was to put "very big ashlar stones, brought by a galley, so that the sea will not be able to move them," which further questions the maritime skills of their

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[61]R. Meiggs, *Roman Ostia* (2nd ed., Oxford, 1973), 155; Theotokis, *Istorikà*, II, 186-187, no. 42; and 246, no. 19 (27 June 1383); ASV, Senato Misti-Secreta, reg. 38, f. 124r (27 June 1384); and reg. 41, f. 15v (18 June 1389); Archivio Proprio Zendrini, Scrittura, reg. 3, ff. 56-59 (9 October 1723); and Noiret, *Documents*, 16 (31 June 1387); 296 (2 July 1423); and 438-439 (11 November 1452).

engineers. Unless maintained constantly the mole did not protect the port, nor could it be used as a quay for the ships loading and unloading goods.[62]

In addition to the extension of the Moslem mole, in 1333 Francesco ordered the building of another structure, "the remains [of sand and stones?] which will be excavated at the end of the northeastern mole, will be employed for its [the northwestern construction's] building." It seems he intended to build a breakwater. The Venetians in the fifteenth century turned this structure into a mole, and by 1500 it required repairs. An iron chain (*catena*) to protect the port against pirates and organized military attacks extended between the breakwater and the northern mole.[63]

Marine Engineering Problems

The second problem to obstruct the function of the port of Candia was its tendency to silt. This was due to several factors. First, there was the fluvial silt brought downstream by the Cacinava River, which originally ran into the port. Francesco therefore ordered it diverted east of the mole and the planned breakwater. The decision of the Venetian Senate in 1372 to dig a moat outside the city walls suggests that this had been done. It is certain, however, that the river ran outside the city by 1474. Second, there was soil from the unpaved town. Since Candia was built on a sharp gradient sloping towards the sea, heavy rains carried soil into the port. Francesco believed that part of the fluvial silt was brought in by the Cacinava River. Third, there was the sand brought in by the waves, which accumulated especially at the entrance to the Arsenal at the eastern end of the Moslem port. The local *signoria* ordered the sale of this sand to individuals who needed it, thus clearing the port and making a profit. The circulation gaps (*bocca*) in the old mole show that its builders had already been aware of this problem. Yet those gaps had to be kept cleared of sand, especially if there were bars (*sacha*) at their western side, as was the case

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[62]ASV, Senato Misti-Secreta, reg. 40, f. 56r (11 December 1386); reg. 39, f. 49v; and reg. 43, f. 96r, 31 December 1395; Senato Mar, reg. 6, f. 692; and reg. 8, f. 134v; Noiret, *Documents*, 60 (26 October 1393), 104 (27 November 1399) and 296 (2 July 1423); and Theotokis, *Istorikà*, II, 24-26, no. 8, 51, no. 4; 186-187, no. 42; and 240-241, no 8.

[63]Gerola, *Monumenti*, IV, 90, note 2; and Thiriet, *Délibérations des assemblées vénitiennes concernant la Romanie*, I, 237, no. 709 (9 October 1363).

in Candia. Francesco completely ignored the silting of the port by sea sand. From his instructions to close the gaps, it seems that he thought that the builders of the old mole had not foreseen the silting from another direction. This other direction involved fluvial silt brought by the Dermata River, which ran along the outer face of the western wall of the old town. Francesco's orders that the excavated sand was to be put in the *sacha* zone proves that he intended to fill up this bay after the diversion of the Dermata River. Certainly, after closing the gaps in the old mole there was no danger of these sediments being carried into the port by the waves. Although Ortelius' topographic map of the area in the sixteenth century still showed this river, it is not depicted on the city plan of the seventeenth century. Yet as one can still see today, Dermata Bay has never been filled up. A final cause for the silting of the port, ignored by Francesco, was the human aspect. The citizens of Candia were used to discarding their old, useless boats and iron and wood refuse on the shoreline and at the entrance to the port. These were carried into the port by the waves and obstructed the anchorage. City dwellers also threw their rubbish into the streets, from where rainwater carried it down to the port.[64]

These factors mentioned in Francesco's report further reinforce the argument that the Venetians inherited a port which had already suffered heavy silting. To dredge the port, Francesco ordered the construction of a special digging machine, most probably like the one he had invented for the excavation of the lagoon in Venice.[65]

The history of the port of Candia shows that the efforts of Francesco and the engineers who followed him failed to solve the silting problem. In May 1350 the Venetian Senate appointed a committee of five

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[64]Theotokis, *Istorikà*, II, 143, no. 38; Noiret, *Documents*, 535 (23 August 1474); "Itinerary of Friar Simon Fitzionis (1322-1324)," in E. Hoade (ed.), *Western Pilgrims* (Jerusalem, 1952), 10; Ch. Schefer (ed.), *Le voyage de la Saincte Cyté de Hierusalem* avec *la description des lieux, portz, villes, citez et aultres passaiges fait l'an 1480* (Amsterdam; 1970), 52; C.D. Hassler (ed.), *Fratris Felicis Fabri Evagatorium in Terrae Sanctae, Arabiae et Egypti peregrinationem* (3 vols., Stuttgart, 1849), III, 281; Vidulich, *Duca di Candia*, 23, no. 23; 42, no. 122; 88, no. 238; 90, no. 244; and 130-131, no. 345; E. Bevilacqua (ed.), *Le immagini dell'isola di Creta nella cartografia storica, raccolte e illustrate da Antonio Ratti* (Venice, 1997), 86 and 91-92; and J. Jegerlehner, "Der Aufstand der Kandiotischen Ritterschat gegen das Mutterland Venedig, 363-1365," Byzantinische Zeitschrift, XII (1903), 102.

[65]Theotokis, *Istorikà*, II, 248-249, no. 7.

to discuss with representatives from Crete the port of Candia. By this time the depth of water inside the port was too shallow for the vessels using it. Undoubtedly the mutiny of 1342, which caused a reduction of income, and the Black Death in 1347-1348 delayed dredging. Yet the bottom was not dredged for the next two years either. When the Veneto-Aragonian fleet, which collaborated in the Third Genoese War, provisioned in Candia after the battle of Bosphorus in 1352, it had to anchor in the Bay of Sudha. At the end of hostilities the Senate ordered the port to be excavated and specified the sum to be invested. Nothing had been done by March 1356 because of a lack of funds. It turned out that Venice raised the taxes of colonies like Crete to pay for the war and the treasury was barren. Moreover, a storm the previous winter had destroyed the mole and caused even greater silting. The Senate therefore ordered a tax increase, mainly of the *commerclum,* to maintain the port, which had been reduced to a dangerous condition. The depth of water was diminished from fourteen Venetian feet (4.86 metres) to seven Venetian feet (2.43 metres), a depth that was too shallow to accommodate even unloaded merchant galleys of the time, which needed about 3.03 metres of water. Moreover, the port could not accommodate the draft of an unloaded *navis* of 1000 *botte* (600 tons), which required 3.38 metres of water.[66]

The Senate's discussions in May, July and August 1356 point to the opposition of the Venetian nobility in Candia to the heavy taxes, which had never been raised at such a rate for the maintenance of the port. Two even protested violently. It is likely that the privilege accorded to Chania in August to export almost all commodities through its own port, exacerbated these feelings. When Rethimon was granted the same rights in 1359, it only made things worse in Candia. This tense atmosphere was one of the motives for the great mutiny in 1363. Discussions in the Senate concerning the port of Candia were renewed in June 1367, close to the end of the mutiny, but concentrated on technicalities, such as the employment of Turkish prisoners as excavators. The debate stressed again the rubbish

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[66] *Ibid.*, I, 248-249, no. 23; and II, 20-21, no. 8; and 24, no. 18; and M.M. Costa, "Sulle battaglia del Bosforo 1352," *Studi Veneziani*, XIV (1972), 205-206, no. 2. I would like to thank the naval architect and marine engineer, H. Winters, who kindly calculated for me the draft of the various merchant vessels, according to data in F.C. Lane, *Ships and Shipbuilders of the Renaissance* (reprint, Baltimore, 1992), 236-238. For the draft of the war galleys, see U. Alertz, "The Naval Architecture and Oar Systems of Medieval and Later Galleys," in Gardiner and Morrison (eds.), *Age of the Galley*, 157; and Quinn, *Design*, 77-89 and 111.

problem as a major source of silting; the *signoria* was ordered to build wheelbarrows for the city cleaners. The mutiny of the 1360s prevented anything from being done until the end of the decade.[67]

Two years after the end of the mutiny, the port of Candia was declared to be dangerous. Yet nothing happened due to a lack of money and because some of the engineers sent from Venice turned out to be unfit; eventually one had to be replaced. In 1376 the Senate ordered that shovels and spades be sent to excavate the silted port. In 1383 these operations also had to include the repair of the old mole and the one built by Francesco.[68]

It was only in October 1393 that the Venetian Senate again discussed the dredging of the port. Two years later the Senate underscored the need to excavate the port "to enable the *navigia* to anchor inside it." But the *signoria* objected to the Genoese engineer Venice had assigned to the job. Eventually he was replaced by Marcus a Bocholis, who came with high recommendations. Nonetheless, he was nominated to be the *magister* in charge of excavations only after having proved his skills for three months. Moreover, the Senate ordered him to travel around the island to contribute his skills where needed. Undoubtedly the Senate meant the ports of Chania and Rethimon, even if they did not mention them by name. But there is no evidence that this instruction was ever carried out.[69]

It is likely that this engineer urged the Senate to discuss again how to deal with the garbage piles, which now had become "mountains" that caused both sanitation problems and silted the port. It is ironic that the last point convinced seventy-two senators to vote, against one opposed and two absentees, for a plan to evacuate the piles to special places outside the

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[67]Theotokis, *Istorikà*, II, 32, no. 27; 33-34, no. 29 (7 July 1356); 47-48, no. 35 (29 August 1356); and 51-52, nos. 4 and 5; and ASV, Notai di Candia, b. 11, f. 85r (26 March 1367).

[68]Theotokis, *Istorikà*, II, 137-138, no. 27; 146-147, no. 42; 159-161, no. 6; 186-187, no. 42; 206, no. 34; 240-241, no. 8; and 273-274, no. 7.

[69]*Ibid.*, II, 273-274, no. 7; ASV, Senato Misti-Secreta, reg. 38, f. 71r (15 September 1383); reg. 43, f. 56v (6 May 1395); and reg. 38, f. 96v (30 December 1395); and Noiret, *Documents*, 60 (26 October 1393).

town. Moreover, the taxes levied for this purpose had to be distributed between all the inhabitants of Candia.[70]

Although the Venetian documents do not deal directly with the condition of the port during the first twenty-five years of the fifteenth century, the Senate's instructions of 1414 and 1425 prove that Venetian engineers were in Candia in those years. In 1414, the engineer Johannes de Bunis was sent to Rethimon to inspect the silting in the local port, while in 1425 the engineer staying in Candia had to go, with or without his excavation machines, to Modon to deepen the local port. It seems reasonable to presume that the Senate would not have issued the last instruction unless the port of Candia was in working order. On the other hand, Piloti, a native of Crete, indicated in 1420 that the port of Palleocastro (Fraschea) was the main port from which vessels sailed northward to Venice. In 1432 Bertrandon de la Broquière ignored the port of Candia when he arrived at Crete on his way to the Levant. Furthermore, the *portolans* of the first half of the fifteenth century recommended the anchorage in the open bay, outside the artificial port of Candia. It should be noted that at that time there was no engineer working in Candia, as the reply of the Senate to the *signoria* in October 1440 suggests. The *signoria* offered to pay the annual salary of the engineer Iohannes Daurodimitri, who was experienced in the excavation of ports. The Senate agreed, providing that the engineer was not on a permanent payroll in the port of Modon. In this case, the *signoria* could pay him on a daily basis only. It is likely that the poor condition of the port of Candia led the *signoria* to win the skilled engineer. In other words, since the early 1430s the artificial port of Candia could not accommodate the various types of vessels. The commercial ships, including the merchant galleys, had to anchor outside the mole. In July 1451 the Senate instructed the captain of a galley arriving at Crete with the Venetian ambassador to the Turkish Sultan to arrive at "the place of Sudha and thence to reach out [to the] city of Candia by the best way they could do it." The galley undoubtedly had to anchor in Sudha Bay, as the Bay of Frashea and the island of Dia were full of ships.[71]

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[70]Noiret, *Documents*, 175-176 (4 March 1407).

[71]C.N. Sathas, *Documents inédites relatifs a l'histoire de la Grece au moyen age* (9 vols., Paris, 1880-1890), III, 280, no. 857 (23 May 1425); ASV, Duca di Candia, Lettere Ricevute, B. 1, No. 11, Ducali Francesco Foscari, f. 46v (24 May 1425);

The order the Senate issued the following year implies that it was not until late 1451 or early 1452 that the port of Candia had been dredged. In October 1452 Venice instructed the signoria to build in Candia on its account a *navis* of 1000-1200 *botte* (600-700 tons) so that the vessel could enter the port and anchor inside. The draft of an unloaded vessel of 600 tons was 2.78 metres, and it required 3.38 metres depth of water; when loaded with a minimum of 240 tons, the draft was 2.95 metres, or 3.55 metres of water. Loaded with a maximum weight of 410 tons, the draft of such a vessel reached 3.82 metres, and it required 4.42 metres of water. In other words, the depth of water inside the port of Candia in 1452 was between 3.38 and 4.42 metres. But whatever the precise depth was, it unfortunately held for less than eight years.[72]

In March 1460 the Venetian Senate discussed a letter sent by the Captain of Crete, who declared that unless urgent means were taken to deepen the port of Candia no war galley or small vessel (*minora navigia)* would be able to enter it. Three months later, the Senate indicated again the dangerous condition of the anchorage inside the port, where vessels of 1000 *botte* used to anchor. The reason for the delay in the excavation was, not surprisingly, a lack of funds and the absence of a proper engineer. The discussions in the Senate between May 1461 and July 1464 show that the excavation of the port did not start until after July 1464. It is interesting to note the tack the *signoria* took to try to accelerate the dredging. Keeping the port in working condition was not only crucial for the security of Candia but also for the trading profits of Venice. While the Senate promised to send the required materials, in November 1462 the *signoria* had to prove it could provide enough money for the operations and the salary of the engineer. The *commerclum* had to be the source of the funds. Venice was strict about this, since its increased military activities against the Ottomans required much money. Eventually, the engineer in charge of the operations in Candia was the *magister* Leo of Coron, who left for

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Gertwagen, "Venetian Modon," 192; *Traité d'Emmanuel Piloti sur le Passage en Terre Sainte 1420* (Louvain, 1958), 133; Ch. Schefer, *Voyage d'Outremer de Bertrandon de la Broquière* (Paris, 1892), 8; "Portolan Parma Magliabecchi," in K. Kretschmer (ed.), *Die italienischen Portolane des Mittelaters* (Berlin, 1909), 319; "Portoland des Gratiosus Benincasa," in *ibid.*, 382; and ASV, Senato Mar, reg. 1, f. 2r (16 October 1440); and reg. 4, ff. 68r-68v (8 July 1451).

[72]ASV, Senato Mar, reg. 4, f. 15r (3 October 1452); and Duca di Candia, B. 2, f. 36r.

Crete after he had been paid in advance in Venice. Leo was replaced in June 1467 by the *magister* Johannes Gesse, who was willing to hold two offices – Captain of the mole and engineer in charge of port maintenance – for the same salary, which was in fact less than what was paid to Leo.[73]

It is hard to tell how long Johannes Gesse had held his office. The pilgrims' reports in the 1470s point clearly to the poor condition of the port. Anselme Adorno, who arrived at Candia in 1470 on his way to the Levant, described the city but ignored the port completely. Since Anselme described the other ports in which his ship anchored, it seems that his failure to discuss Candia was made because his ship did not anchor inside the port. Furthermore, a *portolan* compiled at that period indicated the island of Standea/Dia while ignoring the port of Candia. The Senate's 1473 instruction to dredge the port further points to its bad condition at the time. Seven years later the galley on which sailed the French pilgrim Felix Faber anchored in the open bay, while the crew and the pilgrims arrived on shore by boat. According to Faber, the galley anchored with the twenty other large commercial vessels between the northern mole and the island of Standea. These ships could also anchor to the east of the moles, where Reuwich drew his picture while escorting Bernhardus von Breydenbach to the Holy Land in 1484. Among other objects, this drawing depicted the eastern mole facing the maritime castle; sailing vessels, mostly small *griperas* on which Buondelmonti sailed; and the *ripa*, with barrels to be loaded.[74]

The port's bottom must have been cleared until the 1490s, as the galley on which Pietro Casola sailed to the Levant in 1494 anchored inside

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[73]Noiret, *Documents*, 451 (4 March 1460); 471 (14 August 1462); and 484 (13 November 1462); ASV, Senato Mar, reg. 6, f. 184v (27 June 1460); reg. 7, f. 3r; f. 22v, f. 71v, f. 89r, f. 114v, f. 125r; reg. 8, f. 134v (25 June 1467); and C.C. Couderc (ed.), "Journal de Voyage de Louis de Rochechouart éveque de Saintes," *Revue d'Orient Latin*, I (1893), 234.

[74]J. Heers and Georgette de Groer (eds.), *Itinéraire d'Anselme Adorno en Terre Sainte (1470-1471)* (Paris, 1978), 159-161 and 363; "Portolan del colfo de Salonichi, MCCCLXXII adi 2 agosto," in G.B. Dosio (ed.), *Ragioni Antique Spettanti all'Arte del Mare et Fabriche de Vasselli, Manuscritto Nautico del Sec. XV* (Venice, 1987), 145; Gerola, *Monumenti*, I, 89-90; Schefer (ed.), *Le Voyage de la Saincte Cyté de Hierusalem*, 49; BNMV, Santo Barsca Milanese, viaggio alli luogi di Terra Sancta, CXLVII (=5910) sec. XV, f. 9v; BNMV, Incun, n. 383, Bernhardus Von Breydenbach, transmarina Peregrinatio in Terram Sanctam, Magonza 1486, f. 19v; and *Fratris Felicis Fabri Evagatorium*, I, 168, and III, 290.

the harbour, although entering was difficult because of the stormy seas and the narrow entrance, most probably because of the accumulation of sea sand. Anchorage conditions worsened again toward the end of the century. During the preparations for the war against the Ottomans, the Cretans recommended in September 1501 that the Venetian fleet not use the port of Candia as a base "because of a lack of water" which, they indicated, was also the case in Chania and Rethimon. The colonists recommended instead the *portus* of Sudha, which they described as a natural bay that they found much better than any of the artificial ports on the island. The colonists found it much more urgent to strengthen the fortifications of the town of Candia and to encircle the *burgus* with a wall. A year later, however, they again asked the Metropolis to send dredging equipment. There are two explanations for this renewed silting. First, the inhabitants of Candia kept throwing their rubbish into the streets, from where it could wash down into the harbour. The other source was the sea sand that crept in from the east. Since sand was a minor problem in the Venetian lagoon, it is not surprising that the engineers sent from Venice were unfamiliar with how to solve this; indeed, the problem of silting was never solved in the Middle Ages. The Venetian engineers sent to Candia were expert in building elaborate machines to excavate fluvial silt, but they did not know how to use the currents and waves to cleanse the ports of sea sand. In the case of Candia, this meant allowing the opposing waves from the northwest to go into the port to carry the sand outside the entrance. They could have done this by opening new gaps (*bocca*), but they did not. Instead, they kept excavating the port as long as they had sufficient funds.[75]

In light of the evidence, it is clear that in the fourteenth and fifteenth centuries the artificial port of Candia was inadequate. It could not provide adequate depth of water or protection against the prevailing winds. Nor did it have quays at which to load and unload cargoes.

The documents pertaining to maintenance in the ports of Rethimon and Chania point to similar problems that the *autochtones* also failed to overcome. Furthermore, in those rare cases when the Venentian engineers stationed at Candia were sent to these ports for consultation, they were unable to devise solutions any better than those already known.

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[75] *Canon Pietro Casola's Pilgrimage*, 198; ASV, Senato Mar, reg. 15, f. 102v, 104r-104v; Gerola, *Monumenti*, I, 90; and *Fratris Felicis Fabri Evagatorium*, III, 284.

It is also noteworthy that the engineers sent from Venice were skilled primarily in building and using excavation devices. They apparently had little if any expertise in building sea walls or moles. It thus seems likely that there were no artificial ports in working order in Crete in the Middle Ages. This was due to three factors: a lack of technical expertise; a persistent shortage of funds; and, at least for Chania and Rethimon, a deliberate policy of neglect designed to make them dependent on the port of Candia. Indeed, it seems that Candia owed its status as the main port during the fourteenth and fifteenth centuries to the political role of the town as the island's administrative centre.

The Layout of the *Portus* of Candia and Its Structures

On the strength of fourteenth- and fifteenth-century documents it is clear that even after Francesco's project, the *portus* of Candia referred to the gulf or even to the whole bay of Candia. Its boundary on the northwest was the Pomontory of Paelaeocastro and its northeastern limit was the island of Standea/Dia. The opening was to the north. Although natural, it was protected. According to Buondelmonti, "we saw far in the open sea the *portus* of Fraschea of the promontory [of Paeleocastro], where [on the promontory] the guardian of Candia is stationed. He is alert and signals the city" when vessels approach. One can assume that if an enemy drew near, war galleys from the local arsenal would have come out to meet the threat. This natural port had four anchorages, three of which were natural havens. Two were the havens at its boundaries, while the third was in the open bay and could be used during calm weather only. In these anchorages the big vessels – the *nefs, galeae a mercato* and the pilgrim galleys – dropped anchor. It is noteworthy that these vessels used to anchor in the bays even when the artificial port was in working condition.[76]

The epidemics that frequently swept the town of Candia were one reason. Such was the case in 1418. In August of that year, the Senate authorized the Captain of the convoy of merchant galleys sailing to Alexandria to "enter inside the mole" only if the epidemic in Candia was over. The *nef* that carried Le Seigneur de Caumont to the Levant anchored the same year off the island of Standea. As this epidemic prevailed the next year as well, the Captain of the next Venetian merchant convoy to

[76]Buondelmonti, *Descriptio*, 145.

Alexandria was ordered to anchor in Frashea. Like the Captain before him, he had to discharge and load cargo using small boats. Similarly, in 1480 a pilgrims' galley from Venice was forced by an epidemic to anchor "par devant le *port* Canée" – in other words, in the open bay. In this case, however, it immediately sailed to Candia, despite the epidemic, probably because of the inconvenient anchorage conditions. In Candia they realized that the epidemic was over when the captain went to the town to check on the local sanitary conditions. In spite of the disappearance of the epidemic, the galley continued to anchor in the open bay because of the marine engineering problems in the artificial port.[77]

The fourth anchorage in the *portus* of Candia was the artificial port. Because of its deficiencies, it was usually used only by boats, small sailing vessels of the *gripera* or *tarida* types, or for the storage of war galleys, usually in the drydocks. In strong winds, however, the entrance to the artificial port was difficult even for *gripera*. Once a vessel entered, it anchored with the stern toward the city. After a ladder was let down, it was tightened to the stern, enabling the people to descend. Yet these craft were in danger of being dashed against one another by high waves.[78]

The Maritime Castle

The entrance to the artificial port was protected by a castle built at the end of the new Venetian mole by the mid-fourteenth century. In 1408 this fortification was called *turris moli* and was commanded by a captain. Reuwich in 1484 still depicted this structure as a fortified tower. But he wrongly identified *La Torre del Castello* at the southern end of the mole as the Maritime Castle. This building was still described as a fortified tower at the beginning of the sixteenth century, when it was damaged by an earthquake in 1508. In 1523 Antonio Saracini, the engineer sent to Candia from Verona, destroyed this tower and replaced it with a strong castle, which today is used as the local museum.[79]

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[77]Noiret, *Documents*, 266 (21 August 1418); Grange (ed.), *Voyage d'outremer*, 42 and 48-49; and ASV, Senato Misti-Secreta, reg. 53, f. 1r (1 September 1419).

[78]Buondelmonti, *Descriptio*, 150-151.

[79]Gertwagen, "L'isola di Creta;" and Gerola, *Monumenti*, I, 130-131.

The Arsenal

The first arsenal in Candia must have been built by the Moslems in the ninth century. Indeed, the term *arsenale* is derived from the Arabic word *Dar al-Sina a,* which was originally a workshop not only for carpentry but also for shipbuilding and the storage of arms. The history of this building before the Venetian period is obscure. Neglected by the Byzantines between the tenth and the thirteenth centuries, it might have been destroyed by the frequent earthquakes that wracked the area. The first arsenal in Venetian Candia was built in 1282, but it was destroyed by the earthquake of 1300. Eventually it was rebuilt and was identified by Gerola as the arsenali antichi, located at the southeastern end of the Moslem port before its enlargement by Francesco delle Barche. Consequently, the sea sand seeping in from the east silted it up until the construction of the eastern breakwater. The arsenal enabled Crete to take part in the Venetian naval defence system from the fourteenth century.[80]

A wide range of activities took place in the Arsenal, and these functions in turn had an impact on the complex of buildings. A key function was the storage of warships. At the beginning of the fourteenth century, vessels of the *ligna* and *parascherma* type, along with the war galleys sent by Venice, were kept in the Arsenal. The *ligna* and *parascherma* were used for commerce, to transport horses, to supply the war galleys and to protect the island. When not at sea, mainly during the winter, these vessels, along with the war galleys, were dragged by some kind of mechanical device to the Arsenal. Instructions for dragging the galleys in *terram nostro arsenatu* show that the Arsenal was also a drydock. When empty, depth of water was not a problem. When the port was heavily silted, boats could have dragged them inside the port.[81]

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[80]Gertwagen, "Crusader Port of Acre," 562; Jacoby, "Les gens de mer dans la marine de guerre v›nitienne de la mer Ecre aux XIVe et XVe siècles," in R. Rogosta (ed.), *Le genti del Mare Mediterraneo, XVIII colloquio internazionale di storia maritima* (Naples, 1981), 172 and note 11; Spyridon, *Mnemia*, 47-48 (13 April 1300); and Gerola, *Monumenti*, IV, 126 and 130. It should be emphasized that Gerola meant only the halls in which the vessels were stored.

[81]For the difference between *lignum* and *galley*, see Jal, *Glossaire nautique*, I, 932-933. For the *lignum*, see Balard, "Coastal Shipping," 135. For the *parascherma,* see Jal, *Glossaire nautique*, II, 1131. See also Gertwagen, "L'isola di Creta," notes 147-148.

It is hard to determine the number of compartments in the Arsenal for this purpose in the first half of the fourteenth century. With the increase of the number of war galleys that Crete had to equip and arm every year, from four in the 1350s to six in November 1362, the Senate ordered the *signoria* to enlarge the arsenal by adding two more vaulted halls (*volti*). With the increase of naval efforts against the Ottomans in the fifteenth century, Candia had to provide another four *trirèmes*. The Senate therefore ordered in 1467 that the Arsenal be enlarged again. In the 1470s the efforts against the Ottomans, who had conquered the important Venetian colony of Negroponte, were further intensified. The Senate ordered Crete to send another five *trirèmes* and to build as quickly as possible proper *cantenarii* for the storage of these vessels. In 1472 the complex contained five *volti,* the length of each was twenty-eight *passi veneziani* (48.72 metres) and the width seven *passi* (12.8 metres). In 1498, five-roofed *volti* and two without roofs were mentioned. In October 1388, the Senate ordered the sale of the *galeota,* which was large enough to occupy an entire hall. The *galeota* should have been replaced by a full-rigged galley (see figure 7). In April 1480 nine war galleys were kept inside the Arsenal. One can safely assume that in the winter, when all the galleys had to be kept in the Arsenal, at least some of these vaulted halls held more than one galley each.[82]

A second role for the Arsenals was to serve as magazines, which were of two types. The first were *camere arsenali*, which contained the material for the vessels, like rigging, anchors, oars and pitch, as well as the equipment necessary for the operations in the port, all provided by Venice. In the magazines, or nearby, were the ropewalks and sail lofts. In 1335 the Venetian Arsenal sent to Candia a rope spinner *(fillacanapus)*, and in 1383 dispatched a machine for weaving cotton sails.[83]

The second type of magazine was the *camere armamenti*, where arms for the warriors were kept. Since the local populace also had weapons, the *signoria* tried to encourage their storage in the Arsenal. With

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[82]Gerola, *Monumenti*, IV, 124 and notes 4-6; Jacoby, "Le gens de mer," 173-174; Noiret, *Documents*, 22-23 (24 October 1388); and ASV, Senato Mar, reg. 9, f. 110r (27 September 1471); and reg. 11, f. 71v (29 April 1480).

[83]Jacoby, "Les gens de mer," 173, only indicated in general terms that the material for the warships, as well as the arms, came from Venice. See also Theotokis, *Istorikà*, I, 168, no. 22; and II, 240-241, no. 8.

the outbreak of the great mutiny in the 1360s, the *signoria* ordered all people who had weapons to return them to the *camere armamenti*.[84]

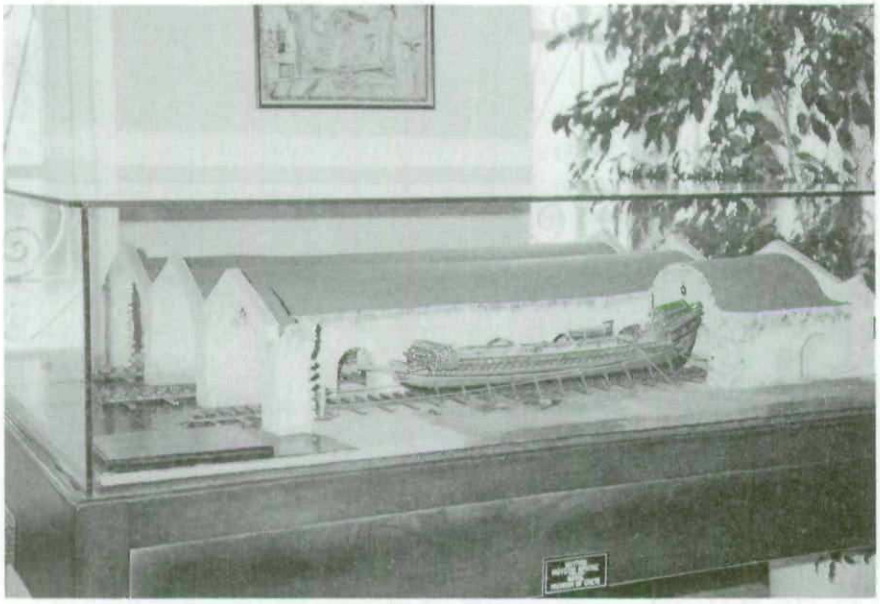

Figure 7: Reconstruction of the Arsenal of Chania – a drydock, keeping a war galley inside, in the local museum.

Source: Courtesy of the author.

Two kinds of arms were kept in these magazines. First, there were the "cold weapons," such as lances, bows and arrows, catapults, armour and helmets, all of which were sent from Venice. To maintain the armour, Venetian in 1335 sent Candia an expert on armour (*magister curaciis*). As firearms became an integral part of warship armament, the Candia Arsenal from the mid-fifteenth century also contained them. As Candia lacked canons, swivel guns and rifles, the Senate in June 1456 sent to Candia a *magister* from Brescia. The Venetian Rector of Brescia had to pay this *magister* his first salary, with the rest paid by Venice. The Candiot

[84]J. Jegerlehner, "Der austand Kandiotischen Ritterschaft gegen das Mutterland Venedig, 1363-1365," *Byzantinische Zeitschrit*, XII (1903), 102 (13 August 1362); 103 (16 August 1363); and 104 (18 August 1363).

Arsenal was the only one in the Venetian colonies to possess a firearms industry.[85]

The third function of the Arsenal was to build and maintain ships. During the fourteenth century only local ships, like *ligna* and *parascherma*, were built in the Arsenal of Canida, while the war galleys and their rigging were sent from Venice. When the war galleys were worn out, the *signoria* sent the old hulls to Venice for replacement with new ones. Sometimes the old hulls were left in Crete to be used for local needs. In 1384 old hulls were used for the construction of moles in Chania, Rethimon and Candia. From the beginning of the fifteenth century, however, the Candiot Arsenal dealt also with the repair of galleys. But despite complaints in the Senate about the large expense of building galleys, Crete was not allowed to construct them. In light of Crete's plentiful supply of wood, which was quite suitable for shipbuilding, it is clear that Venice aimed to maintain direct control over the warship industry and to prevent the colonies from developing this expertise. One of the means to realize this direct control was to make the woods a Venetian monopoly, but even this did not stop military shipbuilding from eventually appearing on the island.[86]

The Archive of Candia, which contains much correspondence between the *signoria* and the other Rectors, includes interesting details about the supply of wood to the Arsenal for the construction and repair of ships. The forests around Rethimon were the main source. The local Rector's letter to the Duke of Crete shows that the main shipbuilder (*primus magister*) of the Candiot arsenal, Leo Miconditi, arrived at Rethimon to select personally the wood he needed; the *magisters* of

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[85]Jacoby, "Les gens de mer," 173 and note 14; Theotokis, *Istorikà*, I, 168, no. 22; and 235, no. 21; ASV, Senato Misti-Secreta, reg. 46, f. 123r (15 December 1403); reg. 57, f. 238r (11 July 1430); Senato Mar, reg. 5, f. 123v (23 December 1455); reg. 5, f. 157v (26 June 1456); reg. 6, f. 57v (26 February 1457); reg. 10, f. 5r (1 April 1477); and reg. 11, f. 71v (29 April 1480); Duca di Candia, Lettere Ricevute, B1, No. 10, f. 56r (8 March 1424); f. 56v (8 March 1424), No. 15; f. 6v (14 March 1432); f. 10v (20 March 1432); and f. 30v (8 December 1432); and Noiret, *Documents*, 470 (14 August 1462). For gunpowder sent from Venice, see ASV, Duca di Candia, Lettere Ricevute, B2, f. 10v (20 March 1432).

[86]Jacoby, "Les gens de mer," 173-174; ASV, Senato Misti-Secreta, reg. 39, f. 24r (19 September 1384); reg. 39, f. 24r (9 November 1384); and reg. 46, f. 92r (20 July 1403); Sathas, *Documents*, II, 252-253, no. 514 (7 July 1410); and Thiriet, *La Romanie vénitienne*, 316.

Rethimon helped him to saw the wood. But the same forest did not necessarily provide the wood for all parts of the vessel. In 1416 the Rector of Rethimon wrote to the Duke of Crete that the local forest lacked the timbers (*maderia*) required by Paridi, the *protomagister* of the Candiot Arsenal, for the repair of one of the war galleys. Eventually the Rector had to import the proper *maderia* from the woods in the south of Crete in a *gripera*. The *signoria* had to pay for the transport to Rethimon. Indeed, the transport of wood was one of the means of livelihood for local mariners. In November 1424 the *Castellan* of Bicornia, west of Rethimon, wrote the *signoria* that it was technically inpossible to send to Candia all sixteen timbers required by Miconditi in a single *gripera*. The *gripera* hired in Chania by Miconditi could carry only eight *maderia*, and the rest had to be sent separately.[87]

The repair of warships in the Candiot Arsenal appears to have been very common since the early fifteenth century, an arrangement that finally was accepted by Venice. In 1477 the Senate ordered the *signoria* and the supreme captain of the Venetian naval force to repair five hulls in the Candiot Arsenal. The Venetian Arsenal sent the rigging and armament. In the end, Venice reversed itself and decided to overcome the separatist tendency of its largest colony by giving it greater power.[88]

Eventually Venice also consented to shipbuilding in the Arsenal of Candia. The construction of war galleys in the Candiot Arsenal was evident in the 1420s, when the Venetian Doge discussed the defects of the new war galley built there. According to a report by the Captain of the Venetian naval force, the vessel was too low, but he did not say if he was referring to its draft or hull. Venice ordered the *protomagister* in Candia to build a new galley. Local shipwrights determined the shape of the vessel, its curve, measurements and draft.[89]

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[87]ASV, Duca di Candia, Lettere Ricevute, B1, No. 6, f. 48r (23 November 1410); f. 11v (15 November 1415); ff. 36r-36v (13 May 1415); and No. 12, ff. 10v-11r (25 November 1424).

[88]Noiret, *Documents*, 541 (29 December 1477).

[89]ASV, Duca di Candia, Lettere Ricevute, B1, No. 10, f. 30v (29 August 1423); Lane, *Ships and Shipbuilders*, 88-99; Concina, *L'arsenale*, 45; and Dotson, "Treaties on Shipbuiding before 1650," in Gardiner and Unger (eds.), *Cogs, Caravels and Galleons*, 160-164.

When word of Leo Miconditi's skills reached Venice, which was short of shipwrights in the first half of the fifteenth century, the Senate summoned him in 1424 to prove his skills in the Metropolitan Arsenal by building a war galley. In typical fashion, the *signoria* was expected to pay for Miconditi's transportation and salary. Venice invited another shipwright as well, the *magister* Leo of Rhodes. Both shipwrights proved their skills. In June 1426 the Senate decided to let Miconditi work in the Metropolitan Arsenal. A year later, the Senate ordered the *signoria* to continue paying his salary, which it had stopped doing. In March 1427 the Venetian Council of Ten told the *patroni* of the Metropolitan Arsenal to let both *magistri* arm their galleys to prepare them for the naval action.[90]

It is difficult to unravel Miconditi's history before 1440, when he applied for the Admiral's position in Candia. One cannot tell if he received it, and he might in any case have continued working in the Arsenal in Candia. In November of that year, the Senate ordered the *signoria* to build two galleys in the local Arsenal, because of the lack of such skills on Crete. Miconditi might have been the shipwright. A fire in the Arsenal in 1441 burned the rigging, destroyed much of the shipbuilding equipment and halted all construction activity for the next four years. In December 1445, the Senate ordered the *patroni* of the arsenal in Venice to build two new war galleys for Crete, for which the *signoria* had to pay. The documents, however, suggest that no construction activity took place in the Candiot Arsenal for another six years. In July 1451 the Senate discussed the fact that there was no navigable galley in this Arsenal, despite the presence of a skilled *magister* and workmen. It was essential that the Candiot Arsenal build several hulls in order to maintain its expertise. The Senate therefore told the *signoria* that every two years the *magister* in charge was to construct a light galley or a medium-sized war galley (*galea bastarda*). Only one Senator objected to this decision. The Duke was liable to a 100-ducat fine if he failed to follow these instructions. In April 1445 the Senate decided that since the death of the *protomagister* in Candia left no skilled shipwright on Crete

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[90]ASV, Duca di Candia, Lettere Ricevute, B1, No. 11, f. 144r (19 February 1424); f. 92v (3 July 1426); and f. 93v (3 July 1426); and Senato Misti-Secreta, reg. 56, f. 3v (16 March 1426). Lane, *Ships and Shipbuilders*, 57-58, discussed only the status of Nicolo in the Arsenal in Venice.

able to build a war galley, it was necessary for the *Collegio* to search for candidates. Three years later the new *protomagister* arrived at Candia.[91]

During the wars with the Ottomans, the Senate in December 1494 ordered four *trirèmes* to be built in Candia. The reason was the good timber, which was much better quality than what was available in Venice. The Venetians paid for the construction and sent the required armaments. Two days later, the Senate voted to send a supervisor (*gubernator*) to the Candiot Arsenal.[92]

The Candiot arsenal was the only one in the main Venetian colonies (Corfu, Methoni, Coron and Negroponte) in which warship building was carried out. One has to bear in mind that arsenals were built in Chania and Rethimon only in 1467, and they were used only for *trirèmes*. Nevertheless, in both places there was intensive private shipbuilding of small vessels, like *gripera* or *ligna*. Some of the local shipwrights likely were the *magistri*, like those who helped Miconditi saw timbers for the Arsenal in Candia in 1410. Small vessels could also have been built in small private shipyards along the beach, as was the case in Candia, as Le Seigneur de Caumont noted in 1418. Indeed, Caumont saw not only small *nefs* and *carracks* but also larger *naves* of 1000 *botte* (600 tons). In emergencies Venice tended to include these vessels in its naval force. In the 1430s, during the war against Genoa, Venice decided to enlist such a *navis*, which was in a process of construction in a private shipyard. The Senate instructed the *signoria* in August 1432 to lend 3000 *hyperperas* to the shipbuilders and to deliver the ship to the Venetian navy by the following March. The *signoria* was to enforce the timetable or pay heavy fines. In 1452, during the struggle against the Ottomans, Venice

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[91]ASV, Collegio Notatorio, reg. 5, f. 5v (14 February 1440); Senato Mar, reg. 1, f. 7r (24 November 1440); reg. 5, f. 85v (19 April 1455); and f. 69r (15 March 1458); and Duca di Candia, Lettere Ricevute, B2, no. 21, f. 3v (7 January 1451); Noiret, *Documents*, 413 (30 December 1445); and 432-433 (8 July 1451); and Concina, *L'arsenale*, 45-46.

[92]ASV, Senato Mar, 45v (16 September 1494); and ff. 45v-46r (18 September 1494).

ordered the Candiot Arsenal to build a *navis* of the same size as the two then being built in the Metropolitan Arsenal.[93]

In the late fifteenth century Venice encouraged the inhabitants of Candia to build *naves*. A discussion in the Senate in November 1488 suggests that the Candiots had not built such vessels for a long time. Nevertheless, the war against the Ottomans demanded new initiatives. The construction was to be done in covered places (*sotto coperte*). Venice promised to pay the builders 1000 ducats and indicated that it would pay even more for larger *naves*. Half of the payment was to be delivered when building began, while the other half was due upon launching. It is likely that shipbuilding also took place in private shipyards near Candia.[94]

Venice also encouraged the inhabitants of other port towns on Crete to construct *naves*. In April 1475 the Senate offered 2000 ducats to the people of Chania who did so. One of them, Manuel the caulker, built an 1800-*botte navis* in 1475. Because of the heavy silting in the port of Chania, construction was carried out in the *portus* of Sudha. This was also where the vessel anchored from July until October 1479 for repairs after only one year of service; in October the Senate ordered the ship sailed to Venice. The fact that no warships were built in the Arsenal of Chania in the late fifteenth century is a testament to the policy of the *signoria* to maintain Candia's supremacy, even if it required heavy burdens in difficult times. The Senate was forced to accept the situation.[95]

The vast variety of activities carried out in the Arsenal of Candia clearly shows that in the fifteenth century it was an urban-industrial complex of docks and magazines, a small replica of the Arsenal in Venice. But in contrast to the docks in the Metropolitan Arsenal, those in Candia were dry. Only a full archaeological study will enable us to get a realistic picture of the whole complex that was the Candiot Arsenal.

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[93]Noiret, *Documents*, 253 (29 August 1418); and 303 (18 November 1414); ASV, Senato Misti-Secreta, reg. 38, f. 87v (1 December 1383); reg. 57, f. 234v (15 July 1430); and reg. 58, f. 144r (19 August 1432); and Theotokis, *Istorikà*, II, 211-212, no. 8.

[94]ASV, Senato Mar, reg. 12, f. 158r (18 November 1488); and f. 159r (18 November 1488).

[95]ASV, Senato Mar, reg. 10, f. 42r (7 April 1475); f. 63r (12 February 1475); reg. 11, f. 36r (7 July 1479); f. 43r (13 August 1479); f. 46v (2 September 1479); and f. 52r (25 October 1479).

The Commercial Magazines

These were related to the international commercial activity carried out in Candia and were used to store the monopoly wares until they were shipped to Venice for the main international fairs at Christmas and in the spring. Two kinds of commodities arrived from Candia. First, there was the agricultural produce of the island, mainly wheat, wine, sugar, cotton, milk, cheese and salt. Before they were shipped to Venice they were kept in the public warehouses under official sealed locks. Some of these products, especially the wines, cheeses and milk, were also sold to private merchants. Such trade must have been carried out in the shops along the main street leading from the port to the southern gate of the city.[96]

The other kind of products stored in special warehouses were the luxurious wares from the east known as *havere subtile*. These included mainly spices and silk. Candia served as a transhipment port for these commodities brought from Alexandria and the Levant in privately-owned vessels. The officials in charge in Candia had to weigh the commodities and to make a list of their owners in order to prevent confusion in Venice and damage to the traders. After this process they were put in the magazines under official seals.[97]

Conclusion

Situated in the southwestern corner of the Aegean, Crete was located far from the main trunk routes that linked the two basins of the Mediterranean. It was only geopolitical shifts that eventually brought the sea lanes closer to Crete. These occurred in both the early Moslem period in the ninth century and in the medieval Venetian era in the thirteenth to sixteenth centuries. It should be emphasized, however, that because of the

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[96]Hocquet, "Productivity Gains," 537-556; Thiriet, *La Romanie vénitienne*, 232-233; Thiriet, "Candie, place marchande dans la Ière moitié de XVe siècle," in Thiriet, *Etude sur la Romanie greco-vénitienne*, 344 and 346-347; Gallina, *Una Società Coloniale*, 22, 62-63 and 95-136; Theotokis, *Istorikà*, II, 206-207, no. 35; Buondelmonti, *Descriptio*, 152-153; *Traité d'Emmanuel Piloti*, 158; and *Canon Pietro Casola's Pilgrimage*, 202-203.

[97]Theotokis, *Istorikà*, II, 113-114, no. 19; 135-136, no. 929; and 153-154, no. 48; ASV, Senato Misti-Secreta, reg. 39, f. 112r (16 July 1385); and reg. 40, f. 43v (12 August 1386); and Noiret, *Documents*, 229 (14 September 1414); 345 (7 September 1430); and 483 (27 August 1462).

marginal economic and strategic importance of the island, the Venetians did not immediately establish dominion over Crete after its acquisition in 1204. Instead, Venice took the island only to prevent it from falling into the hands of the Genoese, who might have impeded its plan to establish an Aegean Empire. Unexpected political circumstances, which go beyond the scope of this essay, foiled this larger scheme. The Venetians only changed their attitudes toward Crete when the political balance-of-power in the eastern Mediterranean shifted, forcing Venice to confront not one but two rivals: Byzantium and Genoa.

The design and rigging of medieval vessels, as well as the winds and currents in the region and the topography of the Cretan coast, forced vessels going via Crete to sail along the northern coast of the island, especially through the Bay of Iraklion and near medieval Candia, which understandably underwent urban development. The Moslems were the first to make Candia the capital of the island, naming it and building an artificial port. This port was already in ruins by the late Byzantine period, a time when Crete reverted to its previous marginal position. The Byzantines ignored Candia and instead retreated to its hinterland, building Temenos, their capital, high on a mountain overlooking Candia and the sea. The Venetians restored Candia to its previous political position only because of its strategic location relative to trade. But when they arrived there were no working artificial harbours along this coast.

The maritime orientation of the island in the Venetian period was symbolized by the development of ports along the northern coast: Chania and Rethimon in the west and Sitia in the east. Once Venice solidified its control over the island at the beginning of the fourteenth century, it improved the agricultural and industrial productivity of Crete and made its ports important for commercial and transhipment purposes. Vessels sailing between Venice and the southeastern Mediterranean, as well as those going between Venice and the Levant or Egypt, called at the island's ports. Moreover, the island became the main Venetian naval base in the eastern Mediterranean.

Despite the growing maritime activity, the Venetians did not initiate the construction of any artificial harbour along the northern coast, except for the rebuilding and enlargement of the ruined Moslem port of Candia in the first half of the fourteenth century. It is likely that this was done because the town was the capital of the island rather than to improve the prospects of trade. It was not until the late fourteenth century that the ports of Rethimon and Chania were built. Crete was not the only place,

however, where the Venetians ignored the needs of ports, for Venice also delayed building ports in two of her other strategic colonies. For example, in Coron, near Modon in the southwestern Peloponnese, the first port construction did not begin until 1315, more than a century after its conquest by Venice. And in Corfu, Venice waited until 1401, a decade and a half after conquering the island, before port construction began, and it was not until 1435 that it was completed.[98] The documents show that it was only the pressure from the local Venetian population to desert Modon, Rethimon and Chania that compelled Venice to act to prevent the collapse of its maritime empire.

In my view Venice did not attribute any importance to the building of ports. Its attitude seems to have been that as long as trade continued to flow, details like the ports through which it had to transit were unimportant. Given this outlook, it is understandable that the Venetian Senate appeased the *signoria* in Crete by opposing the construction of Chania and Rethimon. The *signoria* wanted to block new construction in order to sustain Candia's position as the main port on the island and to continue to enjoy the revenues from the *commerclum*.

The perspective of those Venetians who agreed to the scheme to settle strategic colonies like Crete was completely different. They discovered quickly that there was a substantial difference between visiting a place for short periods and living there permanently, and their experience in Modon, Chania and Rethimon proved to them that intensive maritime activity attracted piracy and attendant organized violence. Further, an exposed shore was an easy target for invasion, which endangered urban settlements even if they were fortified.[99] In other words, the settlers considered artificial ports as frontal fortifications. It is safe to conclude that security, commercial and economic needs were the motives for the construction of these Venetian ports. Indeed, the documents about Corfu show that security was the motive for port construction there as well. Still, it is difficult to understand why Venice waited until the

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[98]On Coron, see ASV, Maggior Consiglio Clericus Civicus, f. 22r. Coron was conquered by Venice, along with Modon, to its west, in 1207. Until the construction of Modon in 1358, Coron was an important regional port; see Gertwagen, "Venetian Modon," 124, notes, 1 and 6, and 128, note 16. For Corfu, see Sathas, *Documents*, II, 50-51, no. 265; and ASV, Senato Misti-Secreta, reg. 58, f. 130v (16 September 1435).

[99]Gertwagen, "Venetian Modon," 128-129.

sixteenth century to build a port at Sitia given the constant Turkish attacks on the area. It should also be noted that no artificial port was ever constructed at Negroponte (Chalkis), the only important Venetian colony in the northeastern Mediterranean. Nor did the local government ever demand such construction.

Candia was the only port in the Venetian colonies to be built by a Venetian engineer. In Rethimon, Cania, Modon, Coron and Corfu the ports were built and generally maintained by local people, such as the Byzantine *autochtones*; rarely was an engineer sent from Venice.[100] It is noteworthy that while engineers sent from Venice were skilled in building and using dredging machines, they lacked the skills necessary to deal with the problems of a port on the open sea. In contrast to the Phoenicians, Greeks and Romans, they did not know how to prevent silting caused by wave action. Further, the Venetian engineers apparently had little expertise in building sea walls or moles. Instead, they used the techniques employed in Venice, which followed the Byzantine model of building moles out of wooden caissons filled with rubble, without the addition of concrete or mortar. When the lime decomposed and the caissons disintegrated, the moles collapsed.

In part, however, these problems were understandable. There are no volcanic zones in the northern Adriatic, and Venice only introduced hydraulic concrete based on *pozzolana* in the mid-eighteenth century. When they did so the Venetians were amazed to discover that the source of the lava was not far away in the port of Livorno in Tuscany.[101] An additional shortcoming was the absence of rubble as foundations for the moles and as a means to strengthen and stabilize the seabed. The use of this technique was far more crucial in an exposed port than in one on a lagoon. While it is beyond the scope of this article to discuss the lack of marine engineering skills in Venice, one would have expected such a maritime civilization to have known of these methods by the Middle Ages. Yet it is also noteworthy that the local Byzantines suffered from the same

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[100] *Ibid.*, 132-138.

[101] ASV, Archivio Proprio Zendrini, Scrittura, reg. 3, ff. 59-67 (9 October 1723). For the works in the Venetian lagoon, see M. Tiepolo, "Difesa a mare," in *Mostra Storic della Laguna di Venezia* (Venice, 1970), 133-138. For similar shortcomings at the port of Modon, see Gertwagen, "Venetian Modon," 133-136.

problems. This suggests that the medieval eastern Mediterranean had suffered a decline in the level of advanced port engineering skills.

This shortcoming was part of the explanation for the absence of artificial ports in working condition in medieval Crete. There were two additional factors: a persistent shortage of funds and, at least for Chania and Rethimon, a deliberate policy of neglect designed to keep them dependent on Candia. Indeed, it seems that Candia owed its position as the main port of the fourteenth and fifteenth centuries largely to its role as the island's administrative centre.

In light of the information adduced here, it is necessary to re-examine the meaning of the Latin term *portus*. This term, at least regarding Candia, did not refer only to the artificial port. Indeed, it had two separate meanings. The first was in reference to artificial ports, although it is notable that it was applied to them only when referring to construction and maintenance, on the one hand, or their function on the other. The second meaning was to denote those places which offered various types of ships adequate water depths and protection against the prevailing winds. From a reading of the various *portolans* and travellers' descriptions this category included Grambousa, Sudha, Fraschea, Dia/Standea and Candia. All these were natural havens. Dia/Standea, however, is an island, and included three natural havens along its southern coast. In the case of Candia it seldom meant the artificial port. On the other hand, most *portolans* ignored those places which did not meet these criteria, or they indicated a suitable substitute, if there was one nearby. It is ironic that this category included the artificial ports of Chania and Rethimon. The artificial port of Candia was omitted only on rare occasions. The detailed descriptions of the topography of the coasts of Crete, made by travellers like Buondelmonti in 1418, are instructive. He referred to Sudha, for example, as a "*portus* without the roaring of the waves." He described one *portus* along the southern coast "that is called in Greek Calolimonia, which is a good *portus*, [because] adjacent to it there are reefs that do not let the winds stir the ships anchoring inside them." Buondelmonti, of course, was discussing a haven, where the natural topography gave it all the advantages of an artificial port in working condition. Of Gramboussa he wrote that "[w]e arrived at the

portus of Gramboussa. We entered through reefs into [that place] where, we judge, we are safe against the wind."[102]

This description is reminiscent of Chania before the construction of the northern quay. But when referring to Chania and Rethimon, Buondelmonti ignored the artificial ports, although he visited both cities on foot. In each case the ship anchored nearby: at Chania in a small bay west of the town and in Rethimon to the east to the centre. For Candia, however, Buondelmonti called both the bay and the artificial port *portus*. Entering the Gulf of Candia the helmsman said that during strong winds, access to the city by sea was impossible. Consequently, the vessel anchored in the *portus* of Frachea, which was in a promontory of Paeleocastro. When discussing the artificial port of Candia, Buondelmonti indicated explicitly that it was "*in qua portus manu artificiose compositus*," surrounded by walls and towers. In other words, the description of the artificial ports in the first half of the fifteenth century clearly distinguished them from the natural havens.[103]

Although the port of Candia was not in working order, the Venetians fortified it well and closed its entrance with a chain. It seems that objective factors caused it to be used as an anchorage by war vessels and small ships with shallow drafts. Those ships that did not possess these characteristics anchored outside the mole or in the natural havens of Candia. Still, its problems did not prevent it from serving as a naval base and an international commercial centre during the Venetian period. Candia had the necessary infrastructure, such as an arsenal, stores, ships and markets. It is now the role of historians, archaeologists and others to reconstruct the relationship between the town and its port.

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[102]Buondelmonti, *Descriptio*, 109, 124, 140 and 227-228.

[103]*Ibid.*, 134-135, 143-144, 146, 150-151 and 210.

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