

On the use of charts and sailing directions for navigation and piloting

Post-conference Workshop

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A B S T R A C T S

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“The Mediterranean portolan chart: its origin and functions”

Portolan charts covering the Mediterranean and Black Seas probably emerged during the 13th century in an unidentified port in western Italy. The oldest survivor, the Carte Pisane, dates from about 1280. The charts' main characteristics were entirely new. Accurate coastlines were placed over a network of compass directions and supplied with a detailed toponymy. The names were written inland so as to leave the sea area free for the islands and, most important, details of the rocks and shoals that threatened to hole or strand a ship.

No sailor ever voluntarily set off to sea without knowing where he should head, what islands or dangers lay on the way, and how long it would take. So, for millennia, those navigating in the Mediterranean would have carried a mental chart based on previous voyages. This is now proposed as the solution to the mystery of the charts' origin, which has puzzled scholars for at least two centuries. At some point, probably around 1200, the network of open-sea courses was downloaded onto vellum in the form of a geometric diagram, forming the basis of the charts we know.

The issue of the charts' origin is inseparable from their various purposes. The geometric accuracy which brought them into being was the crucial factor. This was preserved for the next four centuries by means of the direct copying of the capes that were used as navigational landmarks. Other elements – such as the configuration of the intervening coastline and the placing of the toponyms – were treated less carefully. Decorative elements and inland detail were introduced by Majorcan chartmakers around 1330.

There was little updating to the hydrography because the charts' main purchasers – sailors and merchants – clearly found them to be adequate. They would not have continued buying them in large numbers otherwise.

The scale of the charts (1:6 million) is too small for in-shore navigation. However, when used at sea they could help to register progress or predict landfall, identify nearby landmarks, and locate a safe anchorage when a storm threatened. The charts had at least three other functions as well. First, for setting a course, second, for reminding the user about the sequence of 2000 place-names, and third, for helping the helmsman through an archipelago. For this last function an ingenious, and counter-intuitive device was developed, seen most obviously in the Aegean. Instead of trying to reproduce the shape

of the 100 islands and islets, they were given their own distinctive, very artificial ‘mnemonic’ shapes.

In a few instances, most noticeably the ‘Catalan Atlas’, coverage was extended to eastern Asia, based on a mixture of travellers’ accounts and legends. Portolan charts started to expand their range of newly encountered coastlines after 1500 - having already recorded the discoveries down Africa’s west coast - so as to document the coasts now being charted in America and Asia. Interestingly, artificial island shapes reappear in Atlantic America, the Indian Ocean and East Indies.

Joaquim ALVES GASPAS, Faculty of Sciences, University of Lisbon, Portugal, Principal Investigator of the Medea-Chart project <https://www.medea-chart.org/>

“What is a nautical chart, really?”

During the sixteenth century and beyond, nautical charts were the single most important source of geographical information for the image of the world that started to be depicted in European maps and atlases, following the maritime expansion. Little is still known, however, about the geometry of those remarkable artefacts. Making use of results obtained with modern techniques of cartometric analysis and numerical modeling, this study clarifies the nature of the early modern nautical chart and shows how its geometry is intimately connected with the contemporaneous navigational methods. Furthermore, it is shown that there was an intrinsic incompatibility between the two cartographic paradigms – the nautical chart and the geographical map – which remained unresolved throughout the sixteenth century and beyond. An eloquent symptom of such incompatibility was the irreparable difference between what was accepted as an accurate map, in the eyes of geographers and cosmographers, and an accurate chart, in the eyes of pilots. The misunderstandings around this issue during the early modern period and the unsuccessful attempts at reconciliation were, in great part, the cause for some well-known polemics among cosmographers, cartographers and pilots, which were not entirely understood by historians. Two major conclusions follow from this research: firstly, nautical charts can only be understood in full cognizance of the navigational techniques they were intended to support; and secondly, nautical charts were instruments for navigation, not attempts at representing the Earth.

Short cv

Joaquim Alves Gaspar is a Captain of the Portuguese Navy (retired), and a specialist in navigation, hydrographic surveying and mathematical cartography. He works presently as a researcher with the Centre for the History of Science and Technology, in the University of Lisbon. His main research interests are the History of Nautical Cartography and Navigation, mostly focused on the genesis and evolution of pre-Mercator nautical charts, using innovative techniques of cartometric analysis and numerical modeling. He has published two books on theoretical cartography and several articles in international peer reviewed journals. Joaquim Alves Gaspar was recently awarded a research grant by the European Research Council, to investigate the genesis and evolution of the medieval and early-modern nautical charts (project Medea-Chart).

Roderich Ptak, Ludwig-Maximilians-Universität, Munich

“The ‘Zheng He Map’: Selected Problems Concerning Its Interpretation”

The so-called *Zheng He hanghai tu* 郑和航海图, or Zheng He map, probably drawn in the early fifteenth century, is among the best-studied Chinese cartographic works of the

Ming period. There are several modern editions of this map and many books and articles which address specific problems related to it. These questions have to do with the sea routes shown on the map and the nautical instructions associated with them, with the identification of certain toponyms, the position of individual locations and the graphical presentation of coastal sectors. This note reviews a selection of such problems. In most cases no solutions are possible, but very often the different options proposed by specialists sound quite spectacular and therefore merit a longer discussion. Here, I shall give special attention to the central section of the Indian Ocean and some of the islands in that region. Furthermore, I shall also address minor points regarding a number of offshore sites near the Pearl River delta and the many atolls in the South China Sea. Other details one may wish to investigate concern the Strait of Singapore and the adjacent islands farther to the south, the Zhoushan Archipelago off the Zhejiang coast and some sectors of the Fujian coast.

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Japanese Navigation and Maritime Cartography, 1440-1640: Japanese Portolans and their Precursors

In the period 1440-1640, Japan's domestic shipping industry prospered, pirates controlled many of the sea-lanes (until warlords unified Japan in 1590), and Japanese mariners actively participated in diplomatic, commercial, and piratical voyages to Korea, Ryūkyū (today's Okinawa), China, and Southeast Asia. This presentation explores how this active seafaring generated innovation in Japanese navigational practices and maritime cartography. Many of the earliest extant examples of Japanese sea maps can be traced to this period. The evolution of Japanese maritime cartography bears the hallmarks of considerable cosmopolitan interaction. Japanese maritime maps often emerged out of processes of regional cartographic circulation and cross-cultural translation. Japanese tended to sail in multiethnic seafaring crews. As a result, extant maps consistently present hybrid, multicultural visions of transnational, sea-centered worlds and maritime regions tied together by trade routes. From this perspective, the introduction of Portuguese portolan technology to Japan in the sixteenth century represented less an irruption of European knowledge into East Asia than continued maritime cartographic innovation and experimentation in a cross-cultural setting.

Families of Japanese sea merchants and lineages of Zen Buddhist monks played pivotal roles in both preserving maritime cartographic lore and spurring innovation. In addition to owning shipping fleets, Japanese sea merchants maintained familial and institutional ties to multiple lands and administered spaces where charts and navigational knowledge could be gathered and shared, including lodgings and ports. They acquired patrons among the pirates and warlords who ruled Japan's coastal regions. Zen monks served as Japan's diplomatic corps. They mastered the poetry, classics, and other elements of the Chinese macroculture that served as a lingua franca across East Asia. Their temples doubled as archives, schools and lodgings for foreign envoys.

This presentation traces the evolution of Japanese hybrid maritime cartography through an examination of three maps, each of which only survived as a result of crises that transformed the ephemera, lore, and experiences of sailors' lives into preservation-worthy objects. The map first is the *Comprehensive Map of Lands Across the Sea to the East (Haedong cheguk*

ch'ongdo) along with accompanying charts of Honshu, Kyushu, and Ryūkyū. These maps were based on maps of Japan and Ryūkyū presented to the court of Chosŏn Korea by Japanese merchants and diplomats, and were preserved by their inclusion in a 1471 Chosŏn Korean handbook on relations with Ryūkyū and Japan. The second is a 1565 maritime map entitled *Mirror of the Eastern Sea and its Havens* (*Canghai jinjing*) drafted by a Ming Chinese literatus named Zheng Shun'gong. Zheng had voyaged to Japan in 1556 in order to convince local warlords to suppress the multiethnic bands of Japanese pirates (*wokou*) that had become a major security threat to Ming China. Zheng derived this map from research into navigation and cartography in Japan and China and his interactions with pirates, Zen monks, and other mariners on his voyages. The third map is a Japanese portolan sea chart (c. 1630), replete with rhumb lines and a Portuguese-style compass rose, once owned by the Kadoya family of sea merchants. The Kadoya sailed between Japan and Southeast Asia in the early seventeenth century as bearers of vermilion seal trading licenses issued by the Tokugawa shogunate. This hybrid map represents the culmination of decades of translation and navigational exchange between Japanese and European knowledge added to the fruits of exchange between Japanese, Chinese, Korean, and Ryūkyūan mariners.