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## Looking at the Kitab-i Bahriye of Piri Reis

*Keywords:* Piri Reis; Kitab-i Bahriye; Mediterranean Sea; Tuscan coast

### *Summary*

These pages consider the Kitab-i Bahriye by Piri Reis, a corsair and later Admiral of the Turkish fleet as well as an authoritative cartographer who worked during the late fifteenth and early sixteenth centuries. The Kitab-i Bahriye is a portolan atlas that includes a treatise on seafaring and usually several charts (varying from a few dozen to over two hundred, depending on the copy) illustrating relatively extensive portions of the Mediterranean coasts.

We shall consider six different versions that are preserved in Istanbul and span over two centuries, focusing primarily on the maps related to the Tuscan coast and archipelago. We will compare these maps with previous and contemporary examples of nautical and terrestrial cartography. Our intention is to focus new attention on a monumental document of Ottoman cartography that enjoyed a remarkably enduring manuscript tradition.

The Kitab-i Bahriye is a navigational treatise, a portolan and an atlas that reconstructs the coastline of the Mediterranean and its islands on several dozen folios. Each of the charts – the most conspicuous nucleus – is, with a few exceptions, associated with an equal number of chapters that enrich the informational content with the characteristics of the relevant places and points of reference, distances and indications related to directions, routes and landing places. While there was no lack of miscellaneous gatherings of nautical information in the Mediterranean, especially Venetian ones, before Piri Reis, no cartographer had ever developed such an effective integration of text and chart or such a complete instrument of seafaring knowledge.

The information we have on the life of Piri Reis is incomplete and almost entirely drawn from his own writings. While his date of birth, sometime around 1470, is uncertain, we do know that it took place in Gelibolu, the site of an important Ottoman naval base. After 1481, Piri Reis sailed with his uncle Kemal, first as a corsair and later as Admiral of the Ottoman fleet. Between 1487 and 1510, he crossed the western basin of the Mediterranean to transport Muslim and Jewish refugees from Spain. After his uncle's death in 1511, Piri Reis left the fleet and withdrew to Gelibolu. This is where he probably designed a world map in 1513 and started organising the abundant information material he had accumulated over his thirty-year seafaring experience. In 1517, he returned to service and assumed the rank of commander in the campaign against Egypt. Around this time his work as a scholar intensified and in 1521 the first version of the Kitab-i Bahriye appeared, followed five years later by a second, longer version with which he sought to obtain the favours of Sultan Suleiman. In 1528, he drew another world map, in which he updated the information of his previous version. Unfortunately, only two fragments of these two great maps remain. In 1547, Piri Reis was appointed Admiral of the Fleet of Egypt and India stationed in Suez. In 1552-53, he led an expedition against the Portuguese to re-conquer Hormuz and two years later, at the unusual age of eighty-four – if his birth date is reliable – he was recalled to Cairo where he was tried and executed for having avoided direct conflict with the enemy.

There is a long tradition of studying the Kitab-i Bahriye by Piri Reis, especially in Turkey and in English-speaking countries, though exhaustive comparative philological studies remain to be done. In 1988,

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the Turkish Ministry of Culture published a 4-volume edition of the manuscript *Ayasofya 2612*, Süleymaniye Kütüphanesi, presenting the charts alongside a Turkish transliteration and an English translation of the text (Kitab-i Bahriye, 1988). Denis Dominique Cardonne completed the first translation into a European language in 1765. The best translation is considered to be an incomplete German one based on the manuscript preserved in Vienna (Kahle, 1926-27). More recently, Mantran (1973, 1977, 1981, 1985) has translated several chapters on the coasts of Algeria, Tunisia, Egypt and France into French. Soucek (1973 [1976]) also worked on Tunisia, Libya and Algeria, producing an English translation in his turn. Loupis (1999b) translated the part related to the Aegean islands and coast into Greek.

In Italy, the Kitab-i Bahriye has not enjoyed the same kind of attention by geographers and historians of cartography, nor scholars of other disciplines. Bausani (1990) produced eight translations, published between 1979 and 1986, related to the different portions of the Italian coast and islands and worked on the transliteration of the toponyms on the charts of the MS *Ayasofya 2612* (1990). Bausani noted that he had based his translation on a comparison between a Turkish text (Piri Reis, *Kitab-i Bahriye*, 1973) and the facsimile in Kahle's Ottoman edition (1926-27). The writing of Galoppini (1993) and Ventura (1990a, 1990b and 1991) have followed to the guidelines of Bausani's work.

There remain a considerable number of manuscripts of the Kitab-i Bahriye (forty-three or maybe forty-four) published over two and a half centuries. None of these are signed and, at least for now, it is impossible to identify the prototypes of the two different editions. We know however that from the beginning the work comprised one section of text and one section of charts that covered the entire Mediterranean. The surviving manuscripts are preserved in the libraries of fourteen different cities in three continents. Unsurprisingly, the largest number is found in Istanbul (twenty-six copies, including those with just the text or just the charts, in eight different libraries). It is therefore understandable how difficult it is to deal with such an abundance of documents only part of which, unfortunately, is easily accessible.

Several competing favourable elements conspired to preserve such a high number of copies. Loupis (1999a) points out the beauty and value of the volumes' outward appearance (materials, colours, binding etc.), at least for the later manuscripts, as well as the particular historical moment for the Ottoman society of the seventeenth century which gradually closed itself off from the outside world. But there are certainly other reasons. For one thing, the author was also famous for being a protagonist of the emergent seafaring tradition of the Ottoman Empire. Piri Reis devoted much of his career as a scholar to producing this work and from what he wrote we understand that he consulted most of the portolans and charts in circulation during his time. Moreover, considering the intended recipient of the second edition, we can also suppose that he devoted just as much attention to updating its information and appearance. Another contributing factor was the original nature of his manuscript, which could reach such a large number of users. Associating a text on the main issues of seafaring with a complete and detailed cartographic apparatus constituted a departure from the traditional portolan or portolan chart. By limiting the areas of maritime space to be represented, users could identify their route from one port to the next, to find the best places to land and to avoid certain dangers common to the sea. The text can also be read as a genuine treatise that enters into the merits of subjects that go beyond the contents of traditional portolans by touching upon matters to do with astronomy, geography, cartography, instruments, etc.

After publishing an essay in *Archivum Ottomanicum* (1993-1994), Goodrich (2004) presented his classification attempt at an international conference in Istanbul, which brought together many of the scholars who have focused their studies on the Kitab-i Bahriye (T.I.P.R.S., 2004). The entire surviving corpus includes more than 5600 recorded charts. The first steps of rationalisation were directed at identifying the sources of the first and second editions. There is a substantial difference in the number of chapters and charts in the two versions. The first version contains 131 chapters and 105-142 charts. The second contains 232 chapters (some of which are not new but rather the result of subdivision) and 215-239 charts, in addition to an introduction and an epilogue in verse. The two versions also display a few light

variations in the sequence of charts that follow the Mediterranean coastline in anti-clockwise order starting from the Aegean. Goodrich identified 26 manuscripts related to the first version and 12 to the second, with three volumes of just text and three volumes of just charts.

The work of Goodrich was enriched by Loupis, who identified a third version in a group of seven manuscripts produced after 1650, nearly a century after the death of Piri Reis (Loupis, 1999a, p. 38). On the basis of formal characteristics, Loupis also identified the provenance of these manuscripts as being two distinct workshops, which produced three and four volumes respectively. These manuscripts are distinguished by their elegance and high artistic value as well as for the presence of smaller-scale charts, world maps and the drawing of the Black Sea. The small-scale charts reveal the possible influence of Italian and Dutch cartography or, more specifically, atlases from the workshop of Battista Agnese, Ottoman atlases and world maps by Giacomo Gastaldi and Abraham Ortelius. Loupis maintains that the cartographic features prevail over the nautical instructions in the text. The entire matter also deserves further study because, according to the same author, these copies carry neither the date of production nor the name of the copyist (Ibid., p. 39). However, Goodrich's meticulous classification and Loupis' rational enrichment risk overshadowing the essential fact that the technique of cartographic rendering in each of the three groups display tangible differences in the drawing of the island and mainland coastlines, the orientation of the charts and the islands, the toponymy and the selection of the geographical components, among other things. Loupis denies that this differences are the result of changes which occurred in the reproduction of the works. He puts them down to "contaminations" derived from new cartographic products that began spreading throughout the eastern Mediterranean from the beginning of the sixteenth century.

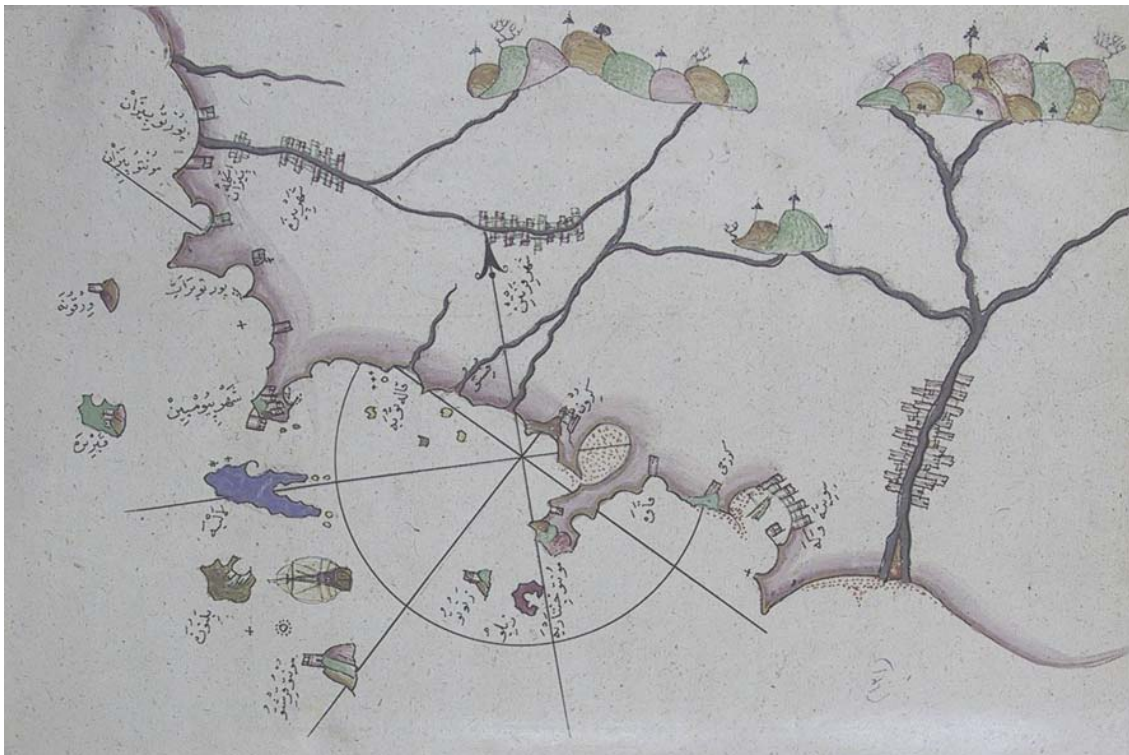


Figure 1: Chart from AS2612 manuscript.

The present article constitutes a preview of research (by F. Lepore, M. Piccardi, E. Pranzini, published in 2011) that was launched to investigate the relationships both among certain manuscripts of the *Kitab-i Bahriye* and between these manuscripts and the rich cartographic production of the fourteenth to sixteenth centuries. For our comparison we have referred to the Tuscan-Ligurian coasts and the islands of

the Tuscan archipelago in the charts of the six manuscripts of the *Kitab-i Bahriye* preserved in the Süleymaniye Kütüphanesi and in the library of the Deniz Müzesi in Istanbul and two manuscripts that can be consulted online (Cod. MS Ori, 34, Kiel Universitätsbibliothek and MS, W. 658, Baltimore, Walters Art Gallery). We examined the following in detail: three charts in the Yeni Cami 790 Manuscript; three charts in the Hamidiye 971 Manuscript; two charts in the Ayasofya 2605 Manuscript; two charts in the Ayasofya 2612 Manuscript; one chart in the Deniz Müzesi 989 Manuscript; and three charts in the Deniz Müzesi 988 Manuscript. The following were also used for some comparisons: two charts in the Kiel Manuscript (19 and 30); five charts in the Baltimore copy (Corsica, 229A; Sardinia, 226B; the Tuscan coast, 244A; the Lazio coast, 240B; and the entire Mediterranean, 63B and 64A); and a chart of the Mediterranean in Manuscript 6605 preserved in the Istanbul Üniversitesi Kütüphanesi.

The collation was originally only intended to uncover a series of data that could identify the peculiarities of the single versions. However, initial results also prompted us to compare what may be the most studied copy (AS2612, Fig. 1) and one that we identified as geographically more accurate (HC971) with more or less contemporary portolan charts and *Isolari*.

For the strictly geographical and toponymic analysis, we took the technical map of the Region of Tuscany in vector format with a scale of 1:10,000. This comparison revealed that the charts in the more reliable version (AS2612) are in fact less accurate than those in either HC971 or DM988.

We therefore propose a comparative reading of various manuscripts to look at the more technical data (the format of the map pages, the symbolism used, the orientation, the placement of the toponyms, a comparison of scale, etc.); a morphological analysis (the drawing of the continental and island coastlines, the placement of the islands of the archipelago in the sea, the outline of the promontories, etc.); and certain formal aspects specifically regarding the drawing. We subjected three areas of the Tuscan region to a more detailed analysis: the archipelago as a whole, the island of Elba and Piombino with its promontory.

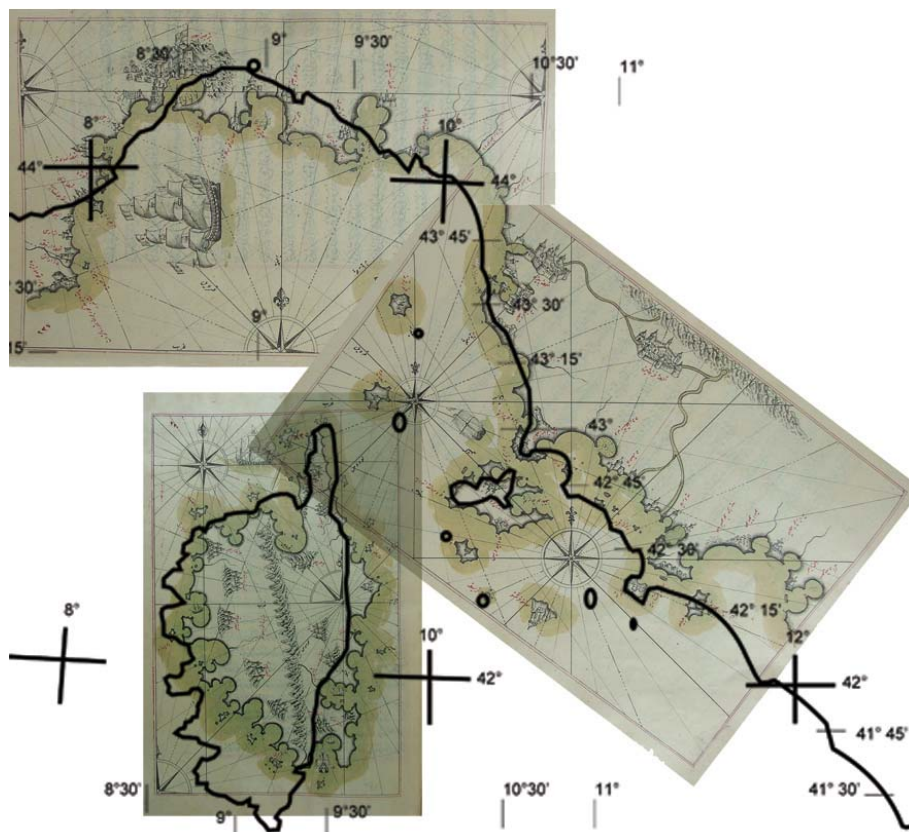


Figure 2: Superimposition of Piri Reis's charts on current coastline (see text).

We therefore attributed a scale to the charts under examination and then began a comparison of the manuscripts overall and within the single manuscripts to identify the possible existence of different sources. To do this we used the measurements proposed by Goodrich, obviously considering the fact that any calculation of scale without a geographical grid must be arbitrary. We therefore resorted to a simple empirical procedure (Fig. 2). We obtained our final data by superimposing Delisle's equidistant conical grid projection onto the coastline of the northern Tyrrhenian from a map of the Italian Peninsula with a scale of 1:3,000,000 in the De Agostini *Atlante d'Italia* (1987, pp. 292-293). We gradually enlarged the Tyrrhenian portion until it adhered approximately to the area illustrated in the charts. Then we calculated the measurement of two degrees of longitude along the linear dimension of the grid in order to compare it with that represented on the corresponding chart. The result allowed us to re-establish a scale for the six Istanbul copies that varies between 1:800,000 and 1:1,300,000.

As far as we can tell, only three of the copies examined have dates in their colophons: YC790 (y. 1551), AS2612 (y. 1574) and AS2605 (y. 1721), therefore spanning nearly two centuries. During this time in Europe, cartographers intensified their efforts to move beyond Ptolemy and to represent space based on objective techniques, seeking to update information and graphic rendering even in small ways. Our manuscripts and the geographical space under consideration reveal a certain static quality that probably reflects the use of a limited number of sources which had used differing formal drawing techniques bringing differing visual results.

The representation of the promontories of Piombino and the Argentario, Elba's coastline and orientation and the essential nature of the toponymic information are common to YC790, AS2612, AS2605, DM989 and KIEL 34. It was difficult to identify a prototype, but we can imagine that the draughtsmen looked at each other's work. Moreover, having the date of YC790, the only manuscript that we know was made during Piri Rei's lifetime, as a reference leads us to assume that this copy is very close to an original source and that it survived for so long precisely because the copiers were well aware that they were copying a manuscript which was traditionally considered the authoritative work. The variations in the information – if we exclude the often-important variants and some displacements of the toponyms – are therefore minimal and all derive from the formal execution. While there may be relatively extensive gulfs and more or less obvious projections, it is essentially a unique representation.

The HC971, DM988 and Baltimore manuscripts are another matter. Their information is much more detailed, including the toponymy, and they appear as significantly more modern tools with which to interpret space. Some new details appear concerning the hydrography, but above all much more attention has been paid to the proportions, as we cannot call it a scale, and to the precise positioning of the places. The latter appear to have been used as a guide for the drawing grid. By superimposing charts related to these three manuscripts, we can see that, with the exception of Elba, there is an exact correspondence in the drawing of the coast and islands between the DM988 and Baltimore manuscripts, and very close similarities between the former and HC971. The proportional relationships are identical, over and above the formal representational technique, and the information of landing places, islands, etc. correspond. However, the marked differences in the toponymic information imply the existence of more than one common source.

The distribution of the toponyms on the charts is intended to avoid ambiguity in recognising their position. We calculated that the results from the portolan charts of the entire Mediterranean ranged, on average, from around 1000 place names in the Carta Pisana to 1500-2000 in fifteenth-century portolan charts (Pujades I Bataller, 2007, p. 480). Leaving aside copy HC971, the charts of the Kitab do not seem to use the greater detail offered by the larger scale to their advantage. The geographical information can be expanded to consider the Tuscan interior though very schematically. The cartographical representation seems more modern in later versions, with city views that look much more realistic (Soucek 1992b).

The charts are cut more or less homogeneously in all the copies. The coastline that we considered is represented in two charts. One represents the Tyrrhenian coast from Civitavecchia to Montenero and the mouth of the Arno in the same chart. The second starts from this point and shows the contour of the entire Gulf of Genoa all the way to the French coast, sometimes represented far beyond Cap Ferrat. The orientation and size of the charts are different and determined by the available space on the pages.

In the introductory chapters devoted to the construction of the charts, Piri Reis defines a key of symbols for the interpretation of the charts and distinguishes the red toponyms of the inhabited areas and cities from the black of the rest. He suggests black dots for seaside rocks, black crosses for hidden rocks and red dots for sandy shallow waters (Kitab-i Bahriye, 1988, p. 89). We must note that there is a difference between the graphical recommendations of the text and their application in the charts. In fact, none of the copies under consideration respect the chromatic distinction between cities, built-up areas and other toponyms. Other indications are also ignored. Furthermore, the lines to identify humid or marshy areas near the coast (the lakes of Prile and Burano and the Seno Pisano) are the same as those used for the gulfs. The important toponymic variants imply that whoever reproduced the manuscript concentrated exclusively on the drawing, disregarding the information contained in the portolan.

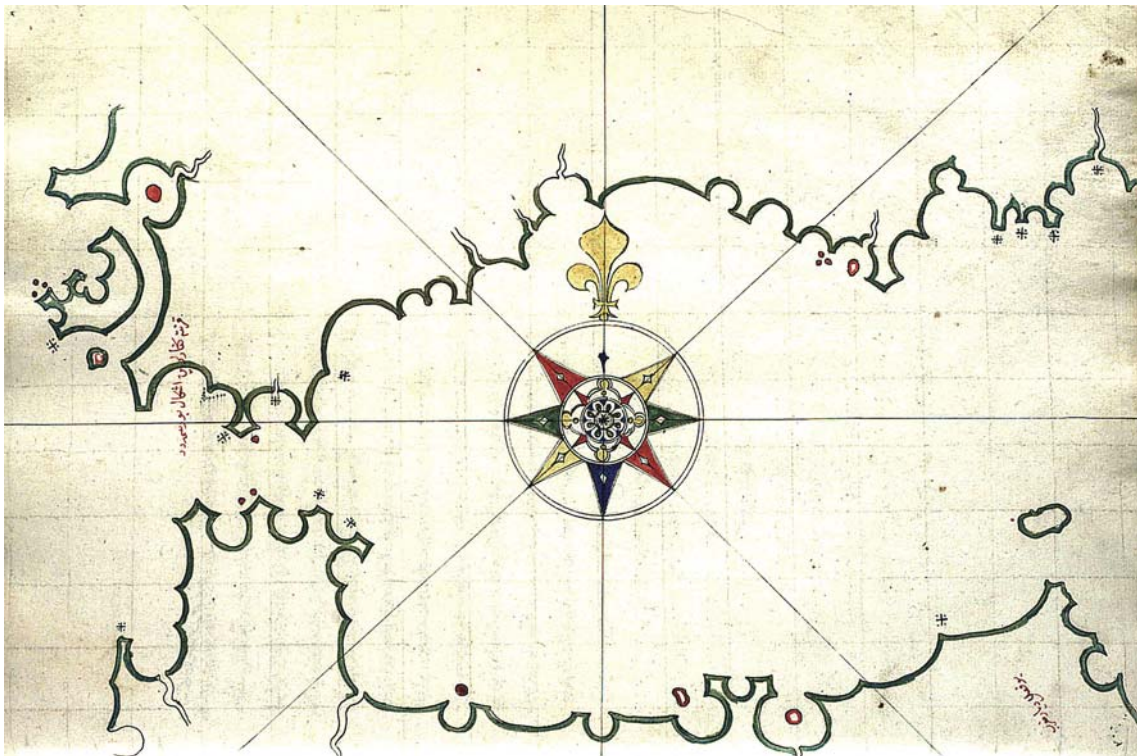


Figure 3: Chart from Manuscript HC971.

An overall view prompts us to offer some considerations on the dating of and the relationships between the manuscripts themselves, having analysed the coastline looking for similarities in the quantity and type of information reproduced in the drawings. It must be noted that all the charts under consideration are proportionate to one another, that is, they seem to derive from a more general representative whole from which scaled portions were extracted (which brings to mind the line of the reproduction grid barely visible on the margins of the pages of Manuscript HC971, Fig 3). More detailed information may have been added based on direct recognition, verbal accounts or large charts that could have originated subdivisions. However, we also have evidence that contradicts this supposed procedure. There are variations between the drawings of the coastline in the chart of the Tyrrhenian Sea in manuscript DM988 and the larger scale charts of the same manuscript, even taking into account that the landing places are made

more evident. In the Baltimore Manuscript, the coastline of Corsica (whose northern part, at least, recalls HC971) in the chart of the Mediterranean is different from that drawn in the chart devoted to the island itself. We are therefore led to assume that multiple sources were used to create the charts in these manuscripts. We also found that the chart of the Tyrrhenian Sea in Codex DM988 is very similar to that of MS W. 658 of the Walters Art Museum in Baltimore as well as that in the atlas drawn by Battista Agnese in 1553, even if Agnese's chart also corresponds to Grazioso Benincasa's portolan chart from 1461 (Fig. 4) in the Florence State Archives – a clear indication of the evolutionary process (that began with Francesco Beccari's chart from 1403) in which the drawing of the normal portolan was established.

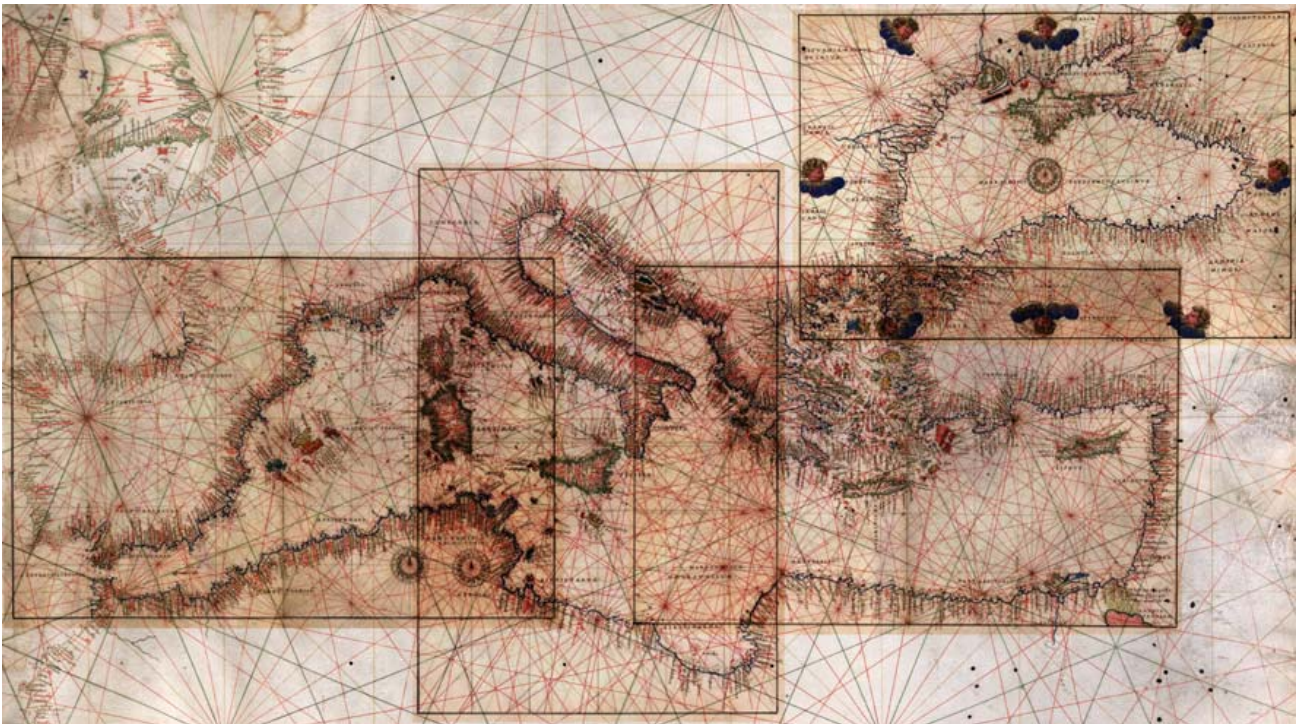


Figure 4: Grazioso Benincasa's portolan (1461).

The first decades of the sixteenth century mark a turning point between an intuitive rendering based on the placement of dots with their related positions noted on a plan and a new search for modes of representation on a true geographical grid. Nevertheless, Beccari's chart is the only surviving fifteenth-century portolan chart with a latitude scale – a clear sign that the estimation of distances at sea, at least in the Mediterranean, had reached such a degree of precision by then that there was no need to change methods. On the other hand, relatively reliable solar declination plates calculated and spread by Arab and Jewish scholars in Andalusia from the early fourteenth century on – and swiftly simplified for use by navigators – also began spreading at this time. Nor can we exclude the use of the astrolabe for acquiring positioning data, even if Michea (1989) has demonstrated the difficult and imprecise nature of on-board surveys, based on his own empirical verification.

The manuscripts under examination respect proportions and fixed points to such an extent that they reconstruct the entire Tyrrhenian coast, chart by chart. Manuscript DM988 does so with acceptable consistency, while in Manuscript HC971 we find Elba and northern Corsica again in the chart of the Ligurian Sea, since in terms of latitude they are in fact positioned within the space of the page. Traces of precise, if not entirely scientific, technical attempts, are found in Piri Reis' introduction to the *Kitab* and, for example, in the declaration contained in his world map of 1513: "... This final form was achieved by reducing all these maps to a scale". The same can be said for the general charts of the Mediterranean in Manuscript 6605 in the Istanbul Üniversitesi Kütüphanesi and in the Baltimore Manuscript (the two

charts correspond and, upon brief examination, seem to have been produced by the same hand or at least the same workshop; see Loupis 1999a) which present a grid for an empty table, which seems to have been prepared to be filled with technical data.

While drawing techniques and respect for scientific data blend together in the more precise copies, some formal aspects can give the same data significantly different forms, even in the case of direct copies. Our eyes are used to a standardisation of cartographic drawing produced with a limited choice of now-customary projections and similarly conventional symbols and colours. The copies of the maps of the *Kitab-i Bahriye*, on the other hand, are unique. Indeed, they were drawn and written according to the taste of their author or groups of authors from the same workshop and from a similar aesthetic background in a precise context. However, while the visual effects produced by the different copies are very different, the informational content is consistent, thus reflecting consolidated and sporadically updated knowledge.

Looking at the Tuscan coastline, we have already noted a few close relationships between the manuscripts under examination. However, we can also identify another group, albeit more diversified, whose point of departure is probably Manuscript AS2612 (y. 1574), already mentioned above in connection with the first group. In fact, like DM988, BALT 658 and DM989, this manuscript includes a schematic description of the mainland that is distinguished by the fact that it represents a slightly different section of Tuscany, a coastline north of Montenero oriented to the NE and with an excessively accentuated crescent shape. The representation of the mountains and the hydrography testify to a wealth of information that is absent in the other group of manuscripts. Other pictorial details, like a ship drawn in the same position and key characteristics of the built-up area of Genoa, tie AS2612 to DM988.

Manuscript HC971 remains momentarily outside both families for a visual impact that is distinctly different from the others it is immediately legible. The coastline was drawn with a very fine black line edged with a thicker green line (the islands of the archipelago, aside from Elba, were redrawn in red). The many toponyms, albeit written minutely, stand out against the whiteness of the page. The pictorial elements are limited to two minuscule representations of Genoa and Portoferraio and a similarly clear and multi-coloured wind rose with a large blue lily pointing north. The coastline is exclusively (and not arbitrarily) drawn with a series of connected semi-circles, interrupted by the mouths of rivers marked by two very fine short black lines, all of which lend an effective graphic elegance to the whole. A similar rendering technique established in the second half of the sixteenth century and adopted for the Aegean Sea by Mehemed Reis among others (see the illustration at the Istituto Italiano di Cultura in Istanbul, 1994, p. 111) stemmed from a Gothicising style of archaic Iberian origin (Guillén y Tato, 1955). The only information Goodrich gives us about this manuscript is the number of charts (116) and the size. We must note that the charts are accompanied by text and that the lack of toponyms in the chart of the Alboran Basin implies that it was left unfinished.

Approaching DM988 from the same perspective reveals important analogies with HC971: the rendering of the coastline; the positions of the archipelago islands; and the positions of the promontories and the main inlets (where we also see the delicate and sinuous drawing of AS2612). It is as though DM988's copyist had rounded off the sharpest angles of HC971 in order to reconcile the two visual renderings. Such correspondences however do not exclude variants in the drawing of the coast that appear, for example, in the drawing of the Gulf of Follonica, the area of the Seno Pisano and the orientation of Elba. Finally, manuscripts HC971 and DM988 have the highest number of toponyms and are the only ones to carry the denominations of *Alagurna* (HC971) and *Kal'a-i Alkorna* (DM988), to indicate Livorno.

These notes, based on a small number of manuscripts, show how much still remains to be investigated regarding the development of early Ottoman cartography, which is often superficially dismissed as an offshoot of its European counterpart. While the late introduction of the printing press in the East undoubtedly prevented geographical ideas and knowledge from spreading, it certainly did not hinder the ef-



forts towards improvement. Just like in Europe, Ottoman cartographic masterpieces updated the results of prior production in an attempt to approach reality, often in very surprising ways.

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