

# The Representation of Navigational Hazards: The Development of Toponymy and Symbology on Portolan Charts from the 13th Century onwards

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## Setting the scene

Written aids for navigating the Mediterranean can be found from classical times. However, the oldest surviving systematic itinerary of its coasts and islands dates from around the early 13th century. Possibly about the same time, and certainly before the earliest extant navigational chart of c.1270, comprehensive knowledge of the Mediterranean had already been codified.

Although they are notable as the earliest surviving charts specifically designed for maritime use, there is still no agreement about the origin and purpose of what have, since at least the 19th century, been known as ‘portolan (or portulan) charts’. They emerged probably in the 13th century, or possibly late in the 12th.<sup>2</sup> Their utility as navigation aids for sailors in the Mediterranean and Black Seas was already noted by Egidio Colonna (Giles of Rome). Around 1280, he wrote that sailors:

seeing the dangers of the sea and wanting to avoid wrecking their own ships, draw a map of the sea on which sea ports, hazards and other such things are described in proportion, from which sailors, looking at them attentively, immediately perceive where they should go and where they are and in which places they should be careful.<sup>3</sup>

Anyone examining a portolan chart and moving their gaze from the coastal outlines and toponymy, and more particularly ignoring the eye-catching artistic flourishes, and focusing instead on the sea area, would notice a myriad of small details close to the coast. This third element (hinted at by Colonna), namely the detailed depictions of the offshore dangers facing medieval galleys and sailing vessels, has been almost entirely overlooked by historians.<sup>4</sup>

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<sup>2</sup> On this see an extensive survey: Tony Campbell, ‘Mediterranean portolan charts: their origin in the mental maps of medieval sailors, their function and their early development’, <https://www.maphistory.info/PortolanOriginsTEXT.html>.

<sup>3</sup> “Sic etiam marinarii faciunt, qui videntes maris pericula, ne eorum naves patiantur naufragium, descripserunt maris mappam ubi portus marini, discrimina maris et cetera talia proportionaliter sunt descripta, qui marinarii intuentes, statim percipiunt qualiter debeant pergere et in quo loco existant et a quibus se debant cavere.” Emmanuelle Vagnon, *Cartographie et représentations occidentales de l’Orient méditerranéen, du milieu du XIIIe à la fin du XVe siècle*. *Terrarum Orbis*, 11 (Turnhout: Brepols, 2013), 140-2. We owe this reference and the English translation to Peter Barber.

<sup>4</sup> See the brief comment in Tony Campbell, ‘Portolan Charts from the Late Thirteenth Century to 1500’, in: J. B. Harley & David Woodward (eds), *The History of Cartography*. Volume 1, 378, and see Catherine Delano Smith, ‘Signs on Printed Topographical Maps’, in David Woodward, ed., *The History of Cartography*. Volume 3, Part 1, 536-44.

From the beginning, the portolan charts paid close attention to the rocks and reefs, shoals and sandbanks, all of which presented a real threat to mariners. They did so by devising a new visual language, formed from black crosses and red dots, which enabled the nature, position, and extent of each feature to be depicted. Though no key is provided, these symbols must have been understood by their users as highlighting specific hazards facing a sailor: isolated rocks just above or below the water and reefs lurking beneath (usually shown with crosses) as well as shoals and sandbanks (normally marked with dots). Over time, these symbols were extended and elaborated, in many cases providing a reasonable match to those shown on the charts of modern hydrographers. Most noticeable of those was the fearsome Skerki Bank, to the west of Sicily. The sheer number of those symbols, and the care with which they were replicated over centuries, makes it reasonable to assert that they must have taken a similar amount of time to add to each drafted chart as the outlines and place-names.

Our evidence for the level of knowledge about navigational hazards shared among medieval mariners comes from two separate but overlapping sources: pilot books and maritime charts. It now seems generally agreed that the Latin-text of the oldest written guide, the *Liber de existencia riveriarum*, should be placed around 1210, while the original version of *Lo compasso de navegare*, the second oldest and written in Italian, is thought to have appeared around the middle of the 13th century, despite the date of 1296 found in the sole surviving example.<sup>5</sup> Such navigational guides (the ancestors of the modern pilot books) provide a descriptive itinerary around the coastlines of the Mediterranean (and, to a lesser extent, the Black Sea). They indicate the distance from one place or natural feature to the next, as well as the direction to be followed, expressed by reference to the prevailing system of ‘winds’ (antecedent to, and absorbed into, the compass directions we now use). Of special note for our purpose, they also identify offshore dangers.

When it comes to cartographic representation, the two supposedly earliest portolan charts are respectively the Carte Pisane (now assigned, on the basis of carbon testing, to c.1270) and the Cortona chart, tentatively placed somewhere around 1300 and certainly before the first dated chart, Pietro Vesconte’s of 1311. The relationship between these portolan charts and the written guides has yet to be resolved.

## **The investigation and its aims**

This article will start with a review of the textual evidence and then describe the development of the symbology used to depict the hazards. It will comment on the accuracy of the notification of those, assess the possible sources, and offer a judgment of the significance of the depicted dangers for the chart-maker and the users afloat. It will seek an answer to some key questions. How might the portolan charts have been used in relation to other tools such as the pilot books (*portolani*) or information memorized by rote? When and how were hazards added to the charts? Pointers will be given to supporting data available online, and to a detailed analysis of specific dangers contained in the key appendix to this article.

Following the example of an earlier hydrographic surveyor, Admiral William Henry Smyth (1788–1865), this article reaffirms the value of the knowledge presented by the early portolan chart-makers, and subsequently lost. In the process, it does more than just turn the

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<sup>5</sup> Patrick Gautier Dalché, *Carte marine et portulan au XIIIe siècle: le “Liber de existencia riveriarum et forma maris nostri Mediterranei”* (Pise, circa 1200); Alessandra Debanne, *Lo Compasso de navegare. Edizione del codice Hamilton 396 con commento linguistico e glossario*.

spotlight for the first time on an element that had been pushed into the shadows in favour of a concentration on the charts' remarkably realistic outlines or their dense toponymy. The joint authors, a portolan-chart historian and a former Hydrographer of the Navy, seek to redress that neglect by documenting the features visible on the charts and/or described in contemporary coastal itineraries (*portolani*), along with their contemporary names when those are available. The graphical and textual evidence that emerged has, for convenience, been gathered into a single Excel spreadsheet.<sup>6</sup> This sets out what has been uncovered about nearly 100 of the more visible or significant instances, from a variety of sources. Among the aspects considered are the nature of the danger and its earliest textual and/or chart appearance.

Having itemized the more prominent depictions of real or imaginary dangers on the portolan charts and related those to modern Admiralty surveys, it is reasonable to pose a few fundamental questions. Given the relatively small scale of the charts, how useful were these warnings for the navigator? Are the symbols sufficiently precise to convey meaningful information? Are the positions of the features accurate enough?

These questions seem not to have been asked (at least generally) other than by Smyth, who pointed out in 1854 that some of the dangers 'discovered' shortly before his time had been pre-figured, centuries earlier, on the portolan charts. 'I have been more particular in citing these curious documents', he wrote, 'because a lesson is thereby afforded us to the mischief of an indiscriminate neglect of old surveys.'<sup>7</sup>

Some of the specific dangers mentioned by Smyth, along with others of significance, will be assessed, separately for medieval and modern mariners, to establish if the portolan charts can be considered to include a practical visual catalogue of those life-threatening dangers that Chaucer's shipman would have known on his voyages 'from Hulle to Cartage' (i.e. north-east England to Tunis) in the late 14th century.<sup>8</sup> An effort was also made to locate the earliest recorded mention of each and, if imaginary, when it was removed.

A major component of the article is the closer look that was taken at sixteen of the more prominent examples of the marine dangers. That this is, for convenience, set out in an appendix should not disguise its central place in this investigation. Those features have been followed through to the present day as continuing obstacles to navigation in the Mediterranean and the northeast Atlantic. Some had to be reinstated on charts in Victorian times after their premature removal by those with little respect for medieval knowledge. Tracing back examples of dangers still shown on today's charts through the four hundred years up to the 17th century, this study will argue that there is clear evidence that the compilers of both the texts and charts realized the importance of providing warnings of hazards amidst their other navigational information.

The symbology, created uniquely for the portolan charts, will be examined. So too will the surprisingly large number of imaginary dangers, some of which would remain for centuries before being discredited. Other sections will look at the likely sources for the warnings, what

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<sup>6</sup> <http://www.maphistory.info/NavigationDangersSummaryTable.xls>

<sup>7</sup> Smyth, *The Mediterranean*, 332. For analysis of his specific comments see the appendix to this article.

<sup>8</sup> *The Riverside Chaucer*, Lines 401-4:

'But of his craft to rekene wel his tydes,

His stremes [currents], and his daungers hym bisides,

His herberwe [harbours] and his moone, his lodemenage [pilotage]

Ther nas noon swich [there was none such as he] from Hulle to Cartage [Tunis].'

the need to include up to 3,500 tiny details on each chart meant for the copyist, and, most important point of all, how that information might have been used to save lives at sea.

Much ongoing investigation of the portolan charts is focused on intensive application of GIS tools for cartometric analysis. This study was developed as part of Pelagios 3, a project of the Pelagios Network ([pelagios.org](http://pelagios.org)) and was hailed as opening a refreshing new perspective. The emphasis within Pelagios on broader use of digital applications for spatial annotation and labelling proved most helpful, particularly in the important area of toponymy, seeking to match medieval labels for the dangers with today's names. Since a number of the names written routinely inside the charts' coastlines actually refer to offshore features (dangers as well as islands), the comprehensive survey of portolan toponymy, with its numbered entries arranged in a clockwise geographical sequence, is cited so as to help locate the hazard's position.<sup>9</sup> It is also suggested that some toponyms may have been included not for (or just for) the expected landward feature but because that name was also applied to an offshore danger. When all that had been done, there was the need to see how the results of that detailed investigation fed into the strengthening narrative of the portolan charts' essential role as a tool for medieval navigation. It will indeed be proposed that one of the major impetuses for the portolan charts' creation may well have been the need, by documenting those dangers as carefully as possible, to provide a tool that would improve sailors' safety.

## **Textual Evidence**

### **Textual antecedents**

In order to understand the extent of the innovations displayed on the portolan charts, it was important to establish how many of the navigational hazards can be traced in texts from the classical period. Clearly, sailors of that time faced the same ship-destroying rocks and reefs and had equivalent difficulties with shoals and sandbanks. An obvious line of enquiry, therefore, was to look for textual corroboration in the Greek and Roman segments of Pelagios 3. Two large difficulties were encountered. The first, when searching for toponyms, was to know what names (no doubt in many alternative forms) might have been given to the major hazards documented in this article. Second, in the likely event that equal difficulty is faced by those working to annotate the texts captured by Pelagios 3, the crucial toponyms may be languishing on the 'unidentified' shelf. Until the ancient name can be linked to today's usage, the circle cannot be completed. A subsidiary sheet of the general Excel listing (headed 'Pelagios') was used to plot the entries for about 50 navigational dangers which it was judged might be found in the works that Pelagios has mined. However, less than half could be traced in the reference gazetteers. Clearly Pelagios provides the best hope for systematic access to early geographical literature. Perhaps it will be possible for future iterations to provide general interlinking.<sup>10</sup> While Greek texts are generally reticent about navigational hazards, the anonymous author of the 'Stadiasmus of the Great Sea' (200 CE?) does include a handful of remarks about rocks, reefs and, in particular, shoals in the Mediterranean.<sup>11</sup> However,

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<sup>9</sup> <http://www.maphistory.info/PortolanChartToponymyFullTableREVISED.xls>

<sup>10</sup> The authors are indebted to the Pelagios 3 project for access to the classical texts, and to Leif Isaksen and Elton Barker personally for stimulating, view-changing ideas.

<sup>11</sup> 'The anonymous Stadiasmus of the Great Sea', translated by Brady Kiesling with Leif Isaksen (2014) from the 1855 Muller edition (in *Geographi Graeci Minores*), paragraphs 57, 112, 114, 117: [https://topostext.org/work.php?work\\_id=217](https://topostext.org/work.php?work_id=217)

references to rocks mostly reflect their role as prominent landmarks rather than any danger they might pose, while ‘sand’ is cited in contexts other than that of sandbanks. But the identified shoals sometimes come with warnings, such as: ‘keep watch as you sail past’, or ‘the shoals make putting in difficult’. Another specific alert, in this case about the ‘high and conspicuous promontory’ of *Aspis* instructs the reader to ‘sail north so that it (the promontory) appears on the left for there are many shoals and rocks in this sea’. Of the particular dangers pinpointed in this article, just two have so far been found in the classical texts: Syrtis Magna, and the shoals around *cercina* (Kerkenna Island) (see Appendix, examples 13 & 14). Despite the supposedly fearsome reputation of the Syrtis shoals, the ‘Stadiasmus’ mentions them without comment and, for the second example, remarks only that, because of the shoals, ‘moderate sized boats sail there’. It is surprising that no mention has been found of the most notable of the Mediterranean dangers, the Skerki Bank (Appendix, example 15), but perhaps that is because the classical name has not yet been recognized.

Searches were made in the work of other authors, and general remarks by Pliny the Elder (*Naturalis Historia*, c.73–4) and Polybius (*The Histories*, second century CE) on the Gulf of Sirte were identified. Pertinent references from Strabo’s *Geographica* are given in the discussion in the appendix.

### **The earliest pilot guides (*portolani*)**

Printed editions of the two earliest medieval *portolani* are available to us: the *Liber de existencia riveriarum* in the authoritative interpretation of Patrick Gautier Dalché and *Lo compasso de navegare*, in Alessandra Debanne’s edition. In each case a toponymic index permits the identification of references to at least some of the navigational dangers.<sup>12</sup>

Gautier Dalché identifies in the *Liber* a reference to the Skerki Bank, here given the medieval form of its name, *chilbi* (line 2261). Although the nature of the danger is left unspecified, it is placed, with reasonable accuracy – in terms of the respective directions and distances in the ‘miles’ of the time (*milliaria*) – in relation to Trapani on Sicily’s west coast and Isola Marettimo west of that, as well as to Tunisia’s Cape Bon and the island of Gimari (Djamour El Kébir) in the Gulf of Tunis (lines 2255-67). Otherwise, only two more of those dangers which can be identified in the *Liber* appear in the list of more prominent features which have been selected for analysis below, namely the Secche della Meloria, off Livorno (Appendix, example 5), and the Shoals of Sirte (example 13).

Also mentioned in the *Liber* is the *petra sancti finadelli*, placed somewhere east of Cefalú on the north coast of Sicily. This was presumably a prominent rock on the coast since there are no offshore rocks in this vicinity. A further category that emerges from the editor’s index to the *Liber* is that of *stagnum*. Referring probably to coastal lagoons, though it might denote swampy ground, the *stagnum* was not precisely a danger, but nor was it inviting.

*Lo compasso* presents a very different picture. The relative independence of its toponymy from that of the *Liber* implies a separate origin rather than continuity, and this is emphasized by the anti-clockwise sequence of features rather than the clockwise progression in the *Liber*. Furthermore, the range of information it offers points to an audience of practicing mariners – markedly different to the milieu in which the *Liber*’s author moved, namely Pisa’s cathedral.

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<sup>12</sup> For the details of those that could be identified, see Columns T & U in the Excel listing at <http://www.maphistory.info/NavigationDangersSummaryTable.xls>.

Debanne supplies a valuable glossary of the technical terminology of the medieval sailor as preserved by the creator of *Lo compasso*. This comprises words referring, *inter alia*, to the measurement of water depth with the sounding lead; the nature of the sea bottom, currents and prevailing winds; the colours and shapes of headlands (to help the helmsman to recognize them); landmarks of whatever kind which could be used to fix the vessel's position; places where ships could find a mooring or safe anchorage; and landing arrangements at ports. For our purposes, the significant element is an extended thesaurus denoting specific dangers:

- rocks or reefs (*clappa / klappa, escoio, farillione, planca, roccia, roches, rupe, scogli / scolli, scolliera*)
- sandy shoals (*arena / arenile, grado, lena, piage / plaia, placca, sabbia, spiaggia*).
- shoals (*asperile, estagno, secca / seche*)

For the study described in this article, the index to Debanne's edition of *Lo compasso*, which picks up some of these terms, particularly variants of the commonest words for rock and shoal, *scoglio* and *secca*, was checked and a considerable number of the dangers were identified. This is a resounding endorsement by its unknown compiler of the relevance and importance of features vital to safety, even survival, for anyone who was planning a voyage or controlling a ship's course. A few of the hazard names feature repeatedly. The most prominent, the Skerki Bank, appears no fewer than a dozen times. Other multiple instances are 1661b *secca de beto* (10 instances) and 1672 *secche de capulia* (8) (combined in the Appendix as example 14), as well as 1587 *secche de sca patriaca* (6), showing familiarity with the shoal water between Jazirat Miṣrātah and Jazirat Barda'ah off Menelao Bay in the Gulf of Bomba.<sup>13</sup> Clearly these were notable reference points, even if as areas to avoid.

These two *portolani*, the *Liber* and *Lo compasso*, usually restrict themselves, at most, to identifying the danger in general terms (rock or reef, shoal or sandbank), indicating its direction and distance from a nearby land feature, and perhaps providing its name. Balancing those warnings are encouraging comments about the depth to be found at that point in the almost tide-less Mediterranean. The *Secca de Beto* (off Sfax in Tunisia) was said to offer a depth of 'viii passi, (et) è bo(m) porto fondo arenile con alaga' (eight *passi*, a good port with a bottom of sand and seaweed).<sup>14</sup>

Other textual sources of navigational dangers may exist but, if so, have not yet been identified.

## The hazards and the symbols used to depict them

### The symbology of the early charts

As the predecessor of one of the co-authors pointed out 40 years ago: 'A marine chart has always been, first and foremost, a navigational instrument'.<sup>15</sup> A chart can go further than a text, locating a hazard's position as closely as the scale allows, showing its extent, and differentiating between various configurations by means of symbols. A mariner could be

<sup>13</sup> Numbers refer to the comprehensive, geographically organised toponymic listing at <http://www.maphistory.info/PortolanChartToponymyFullTableREVISED.xls>

<sup>14</sup> Debanne, *Lo compasso*, 52-4, 79. She was unable to provide estimates of the length of a *passo*, evidently not the French pace of about 80 cm (31½ inches), nor a more general version of that measuring 150 cm (59 inches), nor the related *palmo*. The latter was the seaman's practical measurement with the span of a spread hand between the extended thumb and fifth finger, about 20-23 cm (8-9 inches) giving 8-9 *palmi* to the fathom (the span of the sailor's extended arms).

<sup>15</sup> Ritchie, '500 years of graphical and symbolical representation on marine charts', 141.

alerted to dangers lurking in the sea in a number of ways through the chart's toponymy and symbology, singly or in concert. One of the most common was the insertion of a name inside the coastline, presumably at the nearest coastal point to that danger, and recognized by one of the hazard terms but not necessarily represented in a way that would distinguish it from genuine landward features. Another was insertion of a name or comment at the appropriate point in the sea, usually, but not necessarily, alongside the relevant symbol; occasionally it is not clear to what precise configuration the toponym refers. A danger might be denoted by an unnamed, isolated symbol, usually a simple black cross or one elaborated with added dots, very occasionally with a comment, for example about depths by sounding. Patterns of red or black dots (or a combination of those), sometimes extensive, represent formations of submerged rocks, shoals, or sandbanks.

Those who created the earliest (now lost) prototype portolan charts, as well as their successors who improved them, developed a system of symbols to differentiate one type of offshore danger from another. The simplest are black dots indicating rocks and red dots for sand or shoals respectively. No explanation has been found defining the precise meaning of those signs in the medieval period, though key sheets certainly exist from at least the 16th century.<sup>16</sup> Some symbols were introduced after the initial period, and their meaning was perhaps altered or refined over time.<sup>17</sup> Danger marks were initially monochrome: the earliest surviving chart, the *Carte Pisane* (c.1280), as well as two others from the formative period, the Cortona and Lucca charts, have no red symbols at all, whereas the earliest dated chart, Pietro Vesconte's of 1311, avoided black entirely and used red alone. As a result, rocks and shoals could not be adequately distinguished. The 1313 Vesconte atlas is the earliest surviving work to apply two colours, thus extending the range of possible symbols and helping to avoid ambiguity. However, it was the Genoese chart in the Riccardiana Library, Florence, plausibly dated to c.1320 (though perhaps earlier) and hence contemporary with the Vescontes' middle period, which first displays the composite grouping of symbols which are best interpreted as a red islet surrounded by black dots for rocks. The consistent use of a range of symbols, employing both black and red, would not emerge until the 15th century. That those conventions are never explained on the charts is the most prominent example of how their effective use at sea depended on oral instruction.

The symbol +, sometimes with a dot in each segment, could be used separately to denote an isolated rock, but it might also be combined in various ways to represent groupings of rocks or sandbanks, or a combination of the two. On modern charts the symbol + depicts 'a dangerous underwater rock of uncertain depth', abbreviated in the analysis in the appendix to 'dangerous rock symbol'. When the cross on modern charts has the added dots, it depicts 'a rock awash at chart datum': that is, one that is level with or scarcely above the surface of the water at lowest Spring tides. This term is abbreviated in the appendix to 'rock awash symbol'. It is used, even if inconsistently, in the especially legible products of Grazioso Benincasa from the 1460s. In the case of the *Écueils de Sorelle* (Appendix, example 16) and in his possible representation of the Banc el Biban (example 14), it would represent a rock awash. It is also used, however, for the Pearl Rock near Gibraltar and the Vada shoal (example 6), neither of which are awash. In some cases, such as the 'vigias' (on which see below, 'Doubtful dangers'), Benincasa may be using the symbol to indicate a danger that

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<sup>16</sup> Ritchie, *ibid.*, 146-7.

<sup>17</sup> 'Development of the signs for navigational dangers', <http://www.maphistory.info/CartePisaneHydrographyTables.docx> [Table 7]

needed to be substantiated in more detail. He certainly uses both symbols generically to highlight the presence of shoals, including, in England, the Goodwin Sands, the banks of the Thames Estuary and its approaches, and the Solent (figure 1), all of which are composed of sand.



Figure 1: Benincasa's representation of the banks of the Solent.

### The most prominent navigational dangers noted on medieval sea charts

On the very early charts it can be difficult to identify hazards with any confidence or to distinguish them from other offshore features. This is partly the result of the primitive treatment of the smaller islands on the Carte Pisane and the Cortona chart, which are shown as no more than circles or small generalized shapes. Then again, from at least 1313 in the atlas containing Pietro Vesconte's first full coverage, numerous warning marks can be seen, for example along the south coast of France. But what exactly do they refer to? For a confident match between symbol and known danger we need a name and/or a distinctive representation, in the right location. Instances where this has been possible are discussed later in this article with others which make their first appearance on the dated charts from 1311 onwards.

In the appendix to this article a careful sample of hazard depictions on the early charts is examined. A small group of features can be singled out for their visual prominence on the medieval charts. Working round the coasts from western France, they comprise<sup>18</sup>:

63. *sain*. Chaussée de Sein (The Saints), representing a significant danger in the approaches to Brest on the French Atlantic coast. This is first seen in Pietro Vesconte's 1313 portolan atlas. Île de Sein is represented by a red triangle, with smaller islets indicated by red shaded circles, and the great tongue of reefs extending to westwards is shown by a tail of black dots (figure 2). This is discussed in the comparison with modern charts in the appendix (example 2).

<sup>18</sup> Numbers refer to the list in <http://www.maphistory.info/PortolanChartToponymyFullTableREVISED.xls>





Figure 2: Chaussée de Sein in Benincasa's 1467 Atlas.

369. **grado de tortosa**. This feature at the mouth of the Rio Ebro is shown as a variously shaped protuberance in the 1313 Vesconte atlas and later charts up to the end of the 17th century. Initially, a red diamond edged with black dots, such depictions would be further elaborated by later chart-makers, presumably to make them less likely to be overlooked. Whilst certainly diagrammatic and exaggerated, this is a very effective generalization providing just as good an alert as the manuscript note on today's charts. British captains operating on this coast during the Napoleonic Wars commented on the outflow of sand from the rivers and depicted them on sketch surveys (figures 3a and b).

816. **Sibenic**. The complex archipelago of islets in the approaches to Sibenic on the Dalmatian coast is represented by scattered red islets on the earliest Catalan charts from 1330 onwards, but the 1403 Francesco Beccari chart entirely fills that space with small red dots. That would be reduced later, with just three lines of red dots visible on the charts of Benincasa from the 1460s, a modest pattern which can still be seen on the 1620 chart of Salvatore Oliva in Harvard University. These are all examples of the use of symbology to give an overall indication of an area of complex navigation.

853. **lagostini**. This Dalmatian archipelago extending east and west from the island of Lastovo can be seen already on the Carte Pisane, south of Curzola, in the form of several small circles. By the time of Angelino Dalorto/Dulceti in 1330 it has become a circle of black dots enclosing a red centre, a depiction which would continue into the 17th century.

1365. **Kharos Bank** (Limnos). A triangular arrangement of dots appears in the 1313 Vesconte atlas (the 1311 chart is not clear at that point) and can still be seen in 1677 as is discussed in detail in the appendix (example 12).

1624. **Shoals of Sirte**. Known to, and much feared by the ancients, this is shown as a circle of black crosses, the single largest hazard feature on the charts, from the Carte Pisane and 1311 Vesconte onwards to at least 1677, with some of the later examples enlarging and elaborating it into a vast spider shape (for an extended discussion, see Appendix, example 13).



Figure 3a: The mouth of the Ebro and the sandbanks (grado de tortosa).



Figure 3b: The same area surveyed by Captain Charles Adam RN in 1813.

1661–1672. **Bancs de Kerkenah.** This is the area a little further to the west, in the Gulf of Gabès, where the Carte Pisane offers its most extensive display of hazard symbols, sprinkling black crosses near the I. de Djerba and around the Isles Kerkenna (*querquene* and *berto*) as well as along the coast either side of Sfax. It was featured from the 1311 Vesconte chart onwards as dense patterns of red dots. These were invariably depicted thereafter, with differing amounts of details, until at least the 17th century (for further details, see Appendix, example 14).

1686. **Skerki Bank.** Probably the single most treacherous feature in the Mediterranean, this was named and depicted on all portolan charts. Referred to just once by name in the *Liber* but at least a dozen times in *Lo compasso*, this appears on the Carte Pisane and other early charts as a single black cross labelled as *quilbo* or *chilbo*.<sup>19</sup> These variations recur on charts in the 17th century, with William Heather showing the English rendering of ‘Quills’ as late as 1802. The developing symbols, combined with its name, would have signalled, fairly accurately, the position of what must have been common knowledge to all medieval sailors (for details, see Appendix, example 15).

**Black Sea and Sea of Azov.** From the first dated chart (Vesconte 1311) red *pointilliste* patterns can be seen in the Black Sea: lines of them running along the north-west shore, then filling up the Karkinitzkiy bay that almost cuts off the Crimean peninsula, and reappearing as multiple lines in the inner recesses of the Sea of Azov. These patterns would be closely imitated by Vesconte’s successors, Benincasa, for example, in the 1460s. A similar treatment can still be seen on the 1639 Pietro Cavallini atlas in the Bibliothèque nationale de France, even if by that stage much of the Black Sea was generally being omitted from the portolan charts, as was the Sea of Azov in this instance.<sup>20</sup> Again, this depiction conveys a generalized picture of the sandy and muddy coastal shoals of that area.

### The toponymy of the navigational hazards

In an attempt to identify named hazards recorded in written and/or cartographic form, a search was made for those terms in textual sources between the 13th and 15th centuries and on portolan charts over their chronological range, which extended from about 1300 to the later part of the 17th century. Konrad Kretschmer’s geographically-organized gazetteer of 1909 remains a valuable source, supplemented with toponyms extracted from the co-author’s comprehensive Excel listing of portolan chart coastal names from northern France to west Morocco.<sup>21</sup> So far this comprises just those toponyms that were included, at some point between *c.*1300 and *c.*1700, in the inward-facing listing along the continental coastlines. This is confusing to a modern researcher since, by definition, most of the dangers will lie offshore, just as a significant number of the names in that same list refer to islands.

It seems as if toponymy and cartography were not always in agreement. If a danger was recorded with a specific name in one of the *portolani*, some feature must presumably have been reported to its compiler. But it appears that the first chart-maker to include the hazard can sometimes have so seriously misplaced it as to render it meaningless. The precise copying which characterizes portolan chart replication would merely entrench that incorrect placement. One example is the *secha de mantello*, shown well to the south of Toulon in an

<sup>19</sup> Debanne, *Lo compasso*, lines 58r 7, 76v -77r, 85-9.

<sup>20</sup> Département des Cartes et Plans, Rés. Ge. DD 2019.

<sup>21</sup> <http://www.maphistory.info/PortolanChartToponymyFullTableREVISED.xls>.

area identified by modern surveys as of uniformly deep water. It was certainly named on a Battista Beccari chart by 1426 (see Appendix, example 4).

## The toponymic catalogue

Supporting the brief descriptions above of a few selected dangers which are mentioned in the 13th-century *portolani* or shown on early charts, a more comprehensive listing of the hazards has been compiled in the form of an Excel spreadsheet recording both the relevant toponyms and the recognizable depictions (usually unnamed).<sup>22</sup> The default sequence is geographical, imitating the clockwise sequence of the toponyms in the earlier comprehensive listing (see footnote 18). Textual and cartographic sources are distinguished. While its focus is on toponymy, the listing does refer to the more significant unnamed depictions on the charts. The information set out in its various columns gives details about those textual references which have been noted, as well as indicating the period during which the feature appeared on the sampled portolan charts (up to 1600 or, if later than that, indicated with a right-pointing arrow). Much of the information derives from the earlier authorities.

Not all the features listed as dangers would necessarily have been treated as such by the charts' users. The symbol for sand, for example, can mean very different things: both the serious hazard of a sandbank or, alternatively, a beach where it could be safe to land. It is well to remember also that alongside the expected references in the coastal toponymy to ports, bays, headlands, river mouths and so on, there was also a range of information to assist a shipmaster in fixing his position or providing a leading line to follow when entering harbour. This is why prominent buildings (churches, towers, castles, etc.) feature regularly, as well as mountains near the coast. Another piece of information, presented on the charts as if it is a toponym, is *saline*. This denoted a coastal salt-works, which could help with location-fixing along a featureless coast.<sup>23</sup> The full Excel toponymic listing includes around 20 of those, some of which appear already in the earliest *portolani* or charts.<sup>24</sup>

## The accuracy of the hazard notifications

### Actual coastal changes

Rocks and reefs are of course immovable (leaving aside seismic or volcanic activity), but sandbanks shift, and river estuaries tend to silt up, sometimes leaving the original port stranded well inland. Those shoals delineated on the charts may well have altered, sometimes substantially, and surprisingly speedily, over the intervening centuries. It is not clear how, at the small scale of the charts, this might be manifested or whether it could indeed assist in dating the coastal outlines on the earliest charts.

In cases where a river mouth was formed of multiple channels those would often move, occasionally dramatically. The portolan chart-makers wisely made no attempt to plot the various detailed configurations of the two main deltas in the Mediterranean, the Rhône and Nile, nor the two largest in the Black Sea, the Danube and the Dnipro. It is unlikely that any

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<sup>22</sup> <http://www.maphistory.info/NavigationDangersSummaryTable.xls>. Artificial numbers in the first column (in pink) provide approximate geographical locations for those offshore and island features not included in that general spreadsheet of mainland names.

<sup>23</sup> Kahane and Bremner, 'Glossario degli antichi portolani italiani', 106.

<sup>24</sup> Sort on Column D of that earlier, general listing.

hydrographical significance was intended (or understood) by the varying arrangement of simple, wedge-shaped ‘islands’ by which the chart-makers denoted those estuaries impressionistically, often with lively colouring. If the vessel was making its way up those rivers, or indeed the Thames or Guadalquivir (when proceeding to London or Seville respectively), they would presumably have taken on a pilot. This would have applied particularly in the case of the ever-changing sandbanks guarding the mouth of the Thames – ferociously depicted on later charts with lines of warning marks. The shipmaster would not therefore have needed detailed information, even if the chart’s small scale could have allowed it.

### **Doubtful dangers (Vigias)**

The term *vigia* is used by hydrographers for a ‘reported danger, usually in deep water, whose position is uncertain or whose existence is doubtful’ and also for a ‘warning on the chart to denote that undiscovered dangers may exist in the neighbourhood’.<sup>25</sup> A thorough study by James E. Kelley, Jr specifically focused on this aspect and identified forty such features in the western Mediterranean.<sup>26</sup> He located them on a chart of 1559, noting when they were first seen, how many of the 19 charts he had examined included those examples, and the actual depth in the area they were supposed to occupy. He found a number already on the *Carte Pisane*, with the remainder being added in stages up to 1450. Our analysis using later resources unavailable to Kelley has enabled us to add to his examples. In particular, scans of the Benincasa atlases up to 1469 provided in a DVD with Ramon Pujades’s comprehensive study provide the clearest picture of the concentration of these features in the seafloor area between the Balearic Islands and Corsica, Sardinia and Sicily, known as the Sardino-Balearic Abyssal Plain.<sup>27</sup>

The most visible of these imaginary features on the charts are two supposed reefs in that deep western basin of the Mediterranean Sea first shown in 1313 and 1373 respectively: one, south-west of Corsica (labelled *sanguenare*) and another, unnamed, midway between Minorca and Sardinia. Various depicted as a line of dots forming a chain between a pair of rock symbols, or a line of such marks, these subsequent elaborations of a single hazard sign do not just warn, they shout out their message, even if the danger was imaginary (figure 4). A feature in the same vicinity as the second of those *vigias* appears as ‘La Casses Bank of 14 fathoms doubtful’ as late as 1852 in J. W. Norie’s chart of the Mediterranean (figure 5). This underlines the reluctance of hydrographers to remove them until the area had been intensively surveyed, a time-consuming task of considerable challenge in offshore waters until very recent times. Thus, the same chart also shows ‘The Fox rock doubtful’ off the southern tip of Sardinia that arose from a report by a Royal Naval captain in 1798.

The main question raised by the *vigias* is why rocks, reefs and shoals were shown where they could not exist, in deep water, and were then copied, in many cases for several centuries. Kelley cites Magnaghi who had suggested that at least one of the fictitious dangers had originally been placed close to the shore and then later moved further out.<sup>28</sup> Kelley disputed

<sup>25</sup> *The Mariner’s Handbook*, 250.

<sup>26</sup> James E. Kelley, Jr, ‘Curious *vigias* in portolan charts’, 41–9. This was the only detailed investigation we have been able to identify relating to the portolan charts’ navigational dangers, though dealing with one specific aspect only.

<sup>27</sup> Ramon Pujades, *Les cartes portolanes: la representació medieval d’una mar solcada*.

<sup>28</sup> Alberto Magnaghi, ‘Nautiche, carte’, 323–31, and, specifically, 325.

that, rightly pointing out that the Carte Pisane already showed those vigias in areas of deep water. Quoting Smyth in support, Kelley proposed that some at least of the vigias might have represented the effects of genuine seismic or volcanic activity on the seabed which had thrown up short-lived islands or created effects that were misinterpreted as navigational hazards.



Figure 4: The vigias between Minorca and Sardinia shown by Benincasa in 1467.

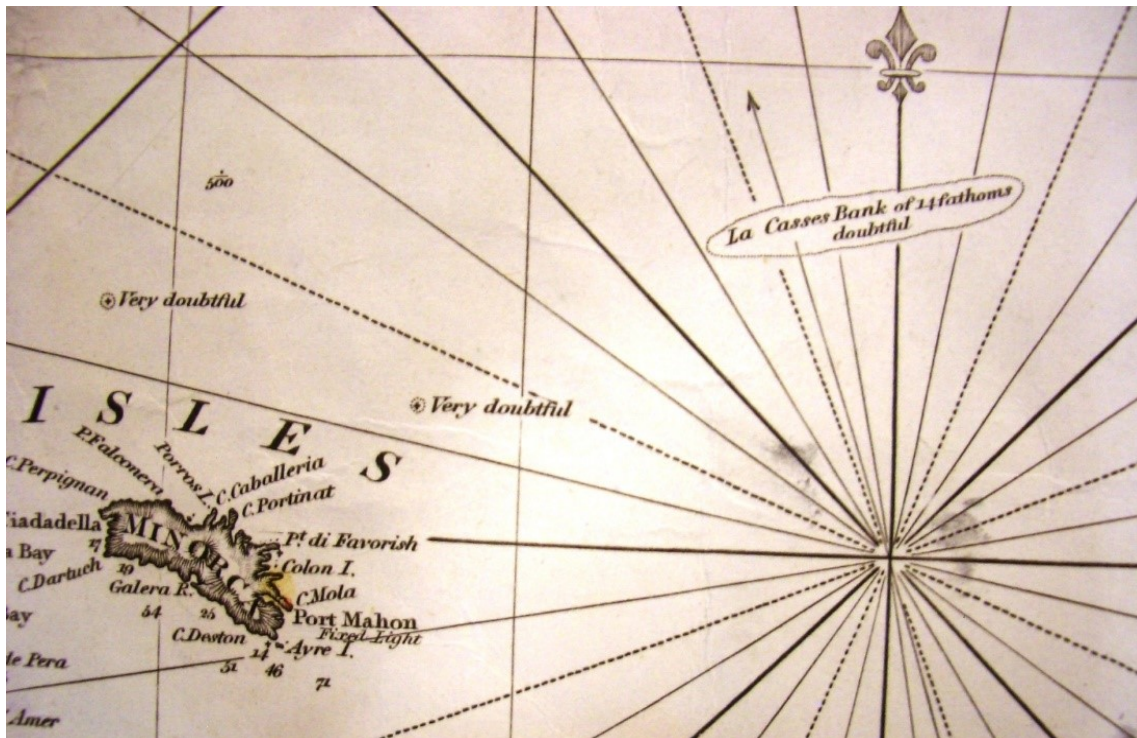


Figure 5: 'La Casses Bank' shown by J. W. Norie in 1852.

No modern hydrographer would ever remove a vigia without having surveyed the area with great care. Hence it is unsurprising that the medieval or early modern chart-maker

receiving reports from mariners plying the routes from Genoa on which many of these vigias lie would be naturally unprepared to take the smallest risk from deleting a potentially fatal hazard. This is perhaps the reason that the unusually innovative Francesco Beccari (a Genoese) was responsible for a number of the vigia additions on his chart of 1403. He and his son Battista also introduced several toponyms to label these features: *secho de mantello*, *secha de sanguenara*, *porminij* (a variant of *choco palmi* 4) and *parminij* (Benincasa's *palmi* VI).

Two vigias elsewhere appeared at first sight to provide promising evidence of an alert to danger. On the chart in the Riccardiana Library, Florence of c.1320 a cross is marked south of Korone in the Peloponnese and west of Crete (907 in the Excel listing). By the time of the 1403 Francesco Beccari chart a note had been added there, 'pelegro bontempo ...', and in 1480 Albino da Canepa expanded that to read 'Jullianus bon tempo ianuensis hic fregit' (the Genoese Giuliano Bontempo was wrecked here). Both Beccari and Canepa were Genoese. Although practitioners from the other production centres do not generally seem to have added that sad note, an atlas from the mid-16th century by the Venetian Battista Agnese (in the Biblioteca Nazionale Marciana, Venice) repeats the formula, omitting the Genoese reference.<sup>29</sup> Unfortunately, if such a wreck really happened it could not have occurred anywhere near where the rock symbol was placed since this is in the deep Hellenic Trench, which contains no features that come anywhere near navigational depths. In the early years of the 17th century that imaginary rock seems to have been removed from the charts.

The second example is the Carte Pisane's famous 'guardate' (watch out!), one of its more striking features, midway between Kefalonia in the Ionian Islands and the southern Italian city of Crotona. That this is repeated on the closely related Lucca chart is not corroboration but rather a case of literal copying. On the other hand, several chart-makers, from the Riccardiana chart onwards, do include an isolated cross in that general area, though somewhat closer to Kefalonia. Once again, although a similar feature recurs in a Spanish Hydrographic Office chart in 1802, with the legend 'seen in 1778', this is imaginary: there are no dangers anywhere near where the Carte Pisane places its dramatic warning, any more than in the alternate location.

### **The first appearance of the dangers on the portolan charts and their continued presence into the 17th century**

The broadly unchanging coastal outlines of the portolan charts after about 1330 might, at a superficial glance, suggest a general conservatism, sustained into the seventeenth century despite occasional careless copying. By contrast, detailed analysis of toponymic change has firmly dismissed any simplistic overall judgement that the names were also static. Hundreds of continental coastal names were added after 1330 and it is often possible to identify the oldest surviving work which shows them.<sup>30</sup> It is against this background that the incorporation of navigational hazards should be plotted.

Just under 100 hazards which were recognized in medieval times have been identified. About half can be seen, with their name, on the portolan charts; the remainder were noted

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<sup>29</sup> Personal communication from Corradino Astengo.

<sup>30</sup> Based on sorting on Columns F & G of the full toponymic listing at <http://www.maphistory.info/PortolanChartToponymyFullTableREVISED.xls>

only in the textual navigation guides.<sup>31</sup> As far as their graphic representation is concerned, 28 appear on the first dated works by Pietro Vesconte, 1311–13. A further 23 were introduced on works from 1318 onwards.

The largest group of additions is first encountered on the charts of the Beccari family, whether that is the single surviving production of Francesco (1403), a 1489 copy of a lost work of his in the Cornaro Atlas, or the 1426 and 1435 charts by his son Battista. Francesco was undoubtedly one of the most innovative of the early chart-makers, notable for his toponymic additions and for correcting the mis-matching scales used for the Atlantic and Mediterranean.<sup>32</sup>

Besides inserting new features, fifteenth-century chart-makers are notable for the enhancement of warnings of hazards, despite the constraint of scale. There had been a blank space on the *Carte Pisane* where the *Bajo La Perla* lies in the SW approaches to Algeciras and Gibraltar, and only small black dots on the charts of Vesconte and Beccari, whereas Benincasa in the 1460s catches attention with two joined up dangerous rock symbols. The rocks around Cabo de Palos and *Islas Hormigas* (E of Cartagena), and *Bajo de la Nao* off Cabo de Santa Pola in the southern approaches to Alicante are significant hazards to coastal shipping. The latter may be indicated by a group of four black dots on the *Carte Pisane*, and dots near the island symbols in Vesconte's representation, but both dangers are first seen clearly on Francesco Beccari's chart of 1403. The enhancements demonstrate that these features were being kept under constant review and endorse the estimate of the portolan charts made by W. H. Smyth, namely that '... many shoals are sufficiently well-placed for a regardful seaman to have avoided them'.<sup>33</sup>

However, overall what is most notable is the apparent randomness in the addition of information.<sup>34</sup> There is no single case in the group of 23 added after 1318 where more than one new danger was added to a chart, at the same time, for a given region. This suggests that each new report of a danger was conveyed by an individual navigator to a particular chart-maker, in a process that continued over a period of centuries. Had there been any concerted attempt to survey those dangers they would have entered the toponymic pool, as a group, and in the work of a single chart-maker.

### **Navigational dangers depicted on the portolan charts and still significant on modern charts**

The list in the appendix of major Mediterranean hazards facing today's ships provides an instructive contrast in terms of priorities. In the Middle Ages, before most reefs and solitary rocks had been marked with a lighthouse or other fixed warning, and before river entrances were dredged or adequate buoys were in position, what today might cause few problems would then have required orally transmitted knowledge and/or positional information on a chart if potentially fatal dangers were to be avoided.

With the exception of the *vigias*, which have been disproved, all the features in that list represent significant hazard to the mariner of today, just as much as to those in the medieval period, sailing (or rowing) without the benefits of light structures, buoyage and electronic

<sup>31</sup> This can be illustrated using column L. 'First seen on a dated chart' in <http://www.maphistory.info/NavigationDangersSummaryTable.xls>

<sup>32</sup> Pujades *Les cartes portolanes*, 493, final section.

<sup>33</sup> Smyth, *Mediterranean*, 332.

<sup>34</sup> See <http://www.maphistory.info/NavigationDangersSummaryTable.xls> (column H, 'Coastal section').



position-fixing systems. Most of the dangers were included in the earlier analysis of Smyth, which is of particular value since he conducted his extensive hydrographic work in the Mediterranean in a sailing ship with a draught of 10 feet 5 inches (3.2 m) that is comparable to precursors in the late Middle Ages.

## **The sources of the information on dangers**

### **What were the likely sources for the information about those navigation hazards?**

Where did those codified details of dangers come from? It cannot be conceived that an early practitioner would have personally collected the information he added to his charts, although this could theoretically have happened later with the Venetian sailor chart-makers of the 15th century: Andrea Bianco, Francesco Cesanis, Nicolo Fiorino, Nicolo Nicolai, Cristoforo and Zuan Soligo, Albertin di Virga, Giacomo Zioldi, and the Anconitan Grazioso Benincasa.<sup>35</sup> Instead, the chart-makers must have had to rely on informants who visited their port: presumably the masters, ship-owners, sailors proficient in navigation, and pilots, to whom Francesco Beccari had listened, as he tells us in a long Latin legend on his chart of 1403.<sup>36</sup> Those sources must also explain no fewer than five steadily improving iterations in the representation of the British islands found on the work of Pietro and Perrino Vesconte in the period 1313–c.1330.

It is clear from this study that the navigational dangers on the portolan charts fall, in terms of steady development, somewhere between the charts' static coastal outlines and their dynamic toponymy. Because of the very precise chart replication procedure which must have been used (even if the technique employed is not clear to us) there is, inevitably, a pattern of unthinking repetition. However, fresh information, sometimes involving deletion, can be observed through the centuries in the extensive visual catalogue of reefs and shoals. Inserting the name of an offshore hazard at what was felt to be the appropriate position in the coastal sequence would have been a relatively straightforward operation for a chart-maker. But adding or altering marks in the sea demanded a different degree of precision. There would need to have been a more detailed description passed from the informant to a chart-maker, who had then to turn those words into the relevant arrangement of the appropriate symbols. Alternatively, the informant might have drawn the feature on his own chart to show subsequently to the maker when back in port. We cannot tell if corroboration of the accuracy of these dangers might have been sought or, if so, whether it could have been found from the types of people listed above by Beccari. But it is reasonable to suppose that news of a fresh danger would have been acted upon more readily than the denial of an existing feature's existence. It also seems likely that reports of shipwreck could have been the spur for some of the additions, which would thus represent a melancholy historical record, even if we have no details of them.

As with all detailed studies into specific aspects of portolan chart history, fresh insights are accompanied by further questions. The vigias, especially those in the western Mediterranean are a good example. As already mentioned, no fewer than nine of the 15th-century Italian chart-makers were also sailors.<sup>37</sup> But did they, on the basis of their personal knowledge of

<sup>35</sup> Falchetta, 'Marinai, mercanti, cartografi, pittori. Ricerche sulla cartografia nautica a Venezia (sec. XIV-XV)', 7-109

<sup>36</sup> The Statement to the Reader is transcribed (but not translated) in Pujades, *Les cartes portolanes*, 461.

<sup>37</sup> Pujades, *Les cartes portolanes*, 401–526.

those routes and the shared experience with colleagues, remove any of those vigias from their own charts? A sampling of the sailors' charts – 1409 Albertin de Viga, the 1443 atlas of Giacomo Ziroldi (Giroldi) and the work of Grazioso Benincasa from 1461 onwards – does not throw up any evidence that they did. Indeed Benincasa, who had previously been a sailor for at least 25 years and the compiler of a written *portolano*, presents one of the fullest pictures of that vigia network. Among others, he seems to have been responsible for upgrading the imaginary reef to the west of Alghero, Sardinia, from two isolated symbols into a fully-fledged barrier, one that would be retained on charts until the early nineteenth century, and variously rendered as *Banco de la Case* or *Casa* and anglicized as *Caccia Bank*.

While it is natural for us to place into different mental compartments those symbols that pointed to recognized, genuine dangers as compared to those which all the available evidence indicates to be imaginary, to the medieval mariner they could only have had equal value. Indeed, given that most vigias occur well away from the cluttered coastline, they were often marked with an unusually large symbol, which in some cases even expanded over time. As historians, we must recognize and respect that the medieval viewpoint may have been very different from our own. There are many plausible explanations for the misinterpretation of what a mariner thought he had seen. What the prominent vigias demonstrate is the technological gulf between the medieval and modern periods, not any difference in the shared priority to highlight threats to a ship's safety.

Another perspective on that technological gulf is opened up by the striking depiction of the Skerki Bank on the Beccari and later charts which indicates awareness of the three most hazardous shoal patches. These were only fully surveyed in the twentieth century (see Appendix, example 15). This suggests that information was brought back by mariners who had called at ports on the west coast of Sicily or on the adjacent islands and quizzed the fishing communities. It was fishermen from Trapani who guided Royal Naval surveyors to Keith reef, the most dangerous patch on the Skerki Bank, at the beginning of the nineteenth century after the loss there of a frigate. Wise hydrographic surveyors still maintain a dialogue with the fishing industry.

## **The significance of the hazard markings for chart-makers and sailors**

### **Why recording the dangers was so important a part of the charts' function**

The written *portolani* and the surveyed charts have overlapping and distinctive elements. The complementary nature of the medieval chart and text might imply a pairing that continues with the Admiralty Chart and Pilot Book, though there is little evidence that fragile paper *portolani* were actually taken to sea.<sup>38</sup> Both provide a systematic sequence of place-names, indicating the distance and direction from one place to the next, or from one terminus of an open-sea voyage to a destination, whether in words or graphically. Where the *portolani* had the advantage was in their ability to include evaluative or historical comments. They might pronounce on the quality of a harbour or where best to anchor; they could pair a headland's name with a comment on its appearance. They could also refer, in general terms, to a marine obstacle, along the coast or in the approaches to a port. But, crucially, they could not (or did not) locate the feature precisely nor depict its nature and extent in the ways that were possible for a chart-maker.

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<sup>38</sup> Pujades, *Les cartes portolanes*, 465a, 519 note 77.

The purpose of the charts' toponyms – the element of most interest to both historians and the Pelagios project – may need to be at least partially reinterpreted in relation to the coastal dangers. A rough estimate found that perhaps half the charts' continental toponyms referred to natural features rather than human geography, though this varied for different types of coastline.<sup>39</sup> Furthermore, a significant proportion of the dangers named on the charts were placed by the draftsmen in the general toponymic sequence, rather than alongside the hazard itself, and thus, at first glance, presented as if they were land features. Absence of space in the sea nearby might sometimes have been the reason for that, though not usually. But are those 'inappropriate' names 'interlopers' or do they rather point to a need for us to interpret the medieval littoral toponymy more elastically, and upgrade our understanding of the contemporary importance attached to such offshore features?

While it is surely correct to link the selection of many place-names for inclusion on the charts to their significance for maritime trade, this should not be overstated. A long-distance sailor focused on navigating safely from one headland to another, and only secondarily from port to port. The referent of a portolan chart toponym is often ambiguous, except where a prefix was included to specify a port, cape, gulf, river mouth, island, etc. There may be a tendency for those today whose focus is on commercial history to interpret a non-specific toponym as automatically referring to a place where trade goods were shipped. But is there sufficient evidence for this? Why, in such cases should the default assumption not be in favour of the natural feature, with its greater maritime relevance? Or maybe we should interpret those single names as portmanteau terms for *all* the local applications, to which the sailor's knowledge or memory could be attached? And might not that toponym have highlighted a danger, which was known to them if not to us, by the name of the nearby feature or settlement?

Such might be the case with the line of dots parallel to the coast on the 1330 Angelino Dalorto/Dulceti chart which Konrad Kretschmer identified as the Roches de Portsall, an offshore hazard on the flank of the northern route into Brest round Pointe de St Mathieu (*sanmae*).<sup>40</sup> Though the associated toponym *porzao* was also used for a port known from the early Middle Ages, it is perhaps fair to surmise that to an experienced medieval mariner the name *porsal* would have conjured up a memory of that reef, with the line of dots serving to remind the less knowledgeable to stand well out at that point, even if they did not know the precise reason for doing so.

### **The practical value of hazard depictions for navigators**

Approaching from another direction we should ask why the portolan draftsmen went to the trouble of inserting that type of specialist navigational information from the very earliest times, imitating, and even expanding the details, over the subsequent centuries. It has been estimated, using the unusually clear scans from a Benincasa atlas, that a portolan chart might contain as many as 3,500 very small hydrographical marks, formed into hundreds of separate symbols made up of red or black dots and crosses, whether singly or in clusters.<sup>41</sup> These were treated in the same way, whether the chart was for everyday use or display. For as many as four centuries (perhaps as many as sixteen generations) successive chart-makers faithfully

<sup>39</sup> <http://www.maphistory.info/ToponymyInnovations.html#meaning>.

<sup>40</sup> Kretschmer, *Die italienischen Portolane des Mittelalters: Ein Beitrag zur Geschichte der Kartographie und Nautik*, 563.

<sup>41</sup> <http://www.maphistory.info/PortolanAttributions.html#patterns> (see 'Small hydrographical details')

reproduced those complex early patterns, which could have been of no concern to anyone but a sailor. Portolan charts were objects of commerce, priced in relation to the time expended on drafting them by hand. In that time-and-money equation the proportion spent on depicting the dangers must have been comparable to that devoted to the outlines and toponymy. The mariners who purchased the charts surely considered those warnings to have been well worth the extra cost.

How would the charts have helped to nudge a sailor's memory? Many of the dangers would have been known about from the earliest times and must surely have formed an important part of the sailor's training, both in eras preceding the charts and during their period of use. From his time as a ship's boy, a sailor would have been required to build up a mental map of those coastlines. Indeed, the legacy can be seen in the practices of sea-going fishermen today. There may also be useful parallels with the process whereby the Black Cab drivers gained their comprehensive 'knowledge' of London's street network.<sup>42</sup> It might not have been necessary for a sailor to memorize all the 2,000 or so toponyms found along the Mediterranean and Black Sea coastlines and their islands on an early chart, since that information was provided there. But the mariner would have valued highly the chart's graphic record of the intricate and elaborate patterns of shoals and reefs along the coastline. Most of those are not named on the charts, even as interpolations into the coastal listing. But they will presumably have been remembered – particularly the most hazardous of them – in relation to a nearby place or feature, whose name they would surely have recalled. While necessarily speculative, it is not too far-fetched to suggest that some toponyms may owe their presence within the rationed space of the portolan chart not to their own significance but *purely* as an oblique alert to a marine danger. The warning did not need to be precisely positioned but rather served to remind the user of what he already knew. This would fit with the aide-mémoire function of the other toponyms – ports, settlements, capes and so on – where the aim was clearly to convey the *sequence* of names rather than the precise *position* of each.

Chaucer's shipman would have considered having a mental store of 'daungers' an essential element of his 'craft'. The preference of English seamen of Chaucer's time (1380s) and subsequent centuries, for an oral, subsequently textual, transmission, especially of warning soundings and of natural marks and transits, reflected the particular challenges of the Atlantic coasts. The frequent poor visibility and strong tidal streams encountered there, did not affect their Mediterranean counterparts in the same way.

It can also be suggested that the later enlargement of some symbols and the development of others into individualized forms might have functioned as a mnemonic aid comparable to that of the stylized artificial shapes given to the smaller islands.<sup>43</sup> In those and other ways, the charts' topological approach is reminiscent of the cartographic pragmatism displayed in the London Underground Map which ignores the reality of what lies above ground. In the same way the charts offered carefully selected help, their toponymy providing the cue for the memorized progression round the shoreline which the mariner required.

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<sup>42</sup> A London Black Cab driver must learn 25,000 street names, 320 standard routes and 20,000 places of public interest (the 'knowledge') and be orally tested on it: <http://www.theknowledgetaxi.co.uk/>.

<sup>43</sup> Tony Campbell, 'Why the artificial shapes for the smaller islands on the portolan charts (1330–1600) help to clarify their navigational use,' 47–65

## Conclusions

This first overview of the representation in the portolan charts of some of the offshore and mid-sea dangers in the Mediterranean, with a side view at the Atlantic, makes it hard to see any other reason for their presence than a need to warn medieval mariners of what they should avoid. Some features would have been generally known to the sailors of the time, others – from their scarcer mentions – apparently less so.

Vigias continue to be reported in the present day and are promulgated by Hydrographic Offices until they have been positively disproved. Similarly, the early practitioners, and particularly the greatest innovator of them all, Francesco Beccari, in introducing so many vigias, must have felt duty bound to do so. The inclusion of these features should not be allowed to tarnish the achievement of the chart-makers who, from at least the late 13th century, laid down the foundations of modern hydrography. They provided in embryo most of the conventions still in use, by first outlining the coastlines with remarkable accuracy and, almost simultaneously, edging them with an extensive visual catalogue of the dangers threatening shipping. Some of those features appear on the oldest known chart, the *Carte Pisane*, but the introduction of further instances on the productions that followed in the 14th and 15th centuries shows there was room, alongside precise workshop duplication, for fresh information to be ‘crowd-sourced’ from the seafaring community.

Given what has been revealed in this article about the extent and general reliability of the charts’ documentation of hazards, and their precocious presence on the earliest surviving charts, it is not unreasonable to end with a thoroughly provocative conclusion. Hiding in plain view on the charts, but ignored for centuries, it seems, by all but W. H. Smyth, was a comprehensive system of nautical warnings, conveyed by means of a newly devised code. That not only served navigators for centuries but can be identified as a possible reason that the charts came into being in the first place. What would have been the primary concerns of a sailor from the later Middle Ages, risking his life in a sailing vessel or galley? Surely, weather, pirates, and the rocks and shoals he had somehow to avoid. Over the first two, portolan charts could have been of little or no assistance. But, in documenting the threatening and predictable offshore hazards, nothing except local knowledge or a portolan chart could have helped keep medieval sailors from harm.

## Appendix

### Modern Examples

All listed positions are on the World Geodetic System 84 (WGS 84). Reference is given to the largest scale British Admiralty (BA) chart and to Sailing Directions (Pilots) published by the UK Hydrographic Office. Larger scale charts may be published by national hydrographic offices.

#### 1. Seven Stones and Wolf Rock

Description: The Seven Stones is a reef NE of the Isles of Scilly with several drying rocks, the most dangerous drying 2.9 m. The Wolf Rock, now surmounted by a lighthouse, is an isolated danger in deep water 7.25 nautical miles [hereafter 'nm'] (13.4 km) SW of Land's End.

Location: In the SW Approaches to the Irish Sea and English Channel between the Isles of Scilly and Land's End.

Position: Pollard Rock on the Seven Stones 50° 02'.5 N 6° 07'.75 W, Wolf Rock 49° 56'.7 N 5° 48'.5 W

First noted appearance on a portolan chart: the Vescontes, on their two latest works only (the 1327 chart signed by Perrino and the unsigned atlas of c.1325–30), show the Wolf Rock as a red-shaded circle with the legend 'lo sei'. Francesco Beccari in 1403 also shows this, together with a group of seven black dots labelled 'vii peras' for the Seven Stones.

Subsequent history and latest appearance on a portolan chart: Grazioso Benincasa in the 1460s mirrors Beccari showing the Seven Stones as a group of seven black dots with the legend 'sette petre', and Wolf Rock as a red-shaded shape with the legend 'lo sei'.

Smyth reference: Not applicable.

Reference in modern charts and Sailing Directions: British Admiralty Chart Number [hereafter BA] 1148; Nautical Publication [hereafter NP] 27 Channel Pilot (11<sup>th</sup> Edition, 2017), 81, 89, paragraphs 3:30 and 3:82.

#### 2. Chaussée de Sein

Description: An archipelago of drying and underwater reefs extending westwards from the Île de Sein, which is separated from the Breton coast south of Brest by the important passage called the Raz de Sein. The archipelago was known to English mariners as 'The Saints'.

Location: W of the Pointe du Raz on the coast of Brittany.

Position: The outermost rock awash lies in 48° 03' N 5° 01' W.

First written reference: 1444-5 Michael of Rhodes (Pietro de Versi).

First noted appearance on a portolan chart: from 1313 Pietro Vesconte shows the reef as a crescent of black dots fringing the W side of Île de Sein, which is depicted as a crescent-shape shaded red. The legend 'saim' is displaced to the S. The Tévenec rock (or Stevenec to English mariners), labelled 'stevagno', which lies in the N approaches to the Raz de Sein, is shown as a red-shaded circle fringed by black dots.

Subsequent history and latest appearance on a portolan chart: F. Beccari in 1403 represents the great tongue of reefs as a tail of black dots extending to westwards of the Ile de Sein.

Benincasa in the 1460s does likewise with the legend ‘Sain’ and shows that island as a red triangle. The dangers in the approaches to the Raz de Sein are shown as red-shaded circles, and are positively identified, the Tévenec labelled ‘stevagnom’, and Le Chat to the S labelled ‘gatta’. Similar forms continued into the 17th century.

Smyth reference: Not applicable.

Reference in modern charts and Sailing Directions: BA 2819 and 2643; NP 27 Channel Pilot (11<sup>th</sup> Edition 2017), 292, 294, paragraphs 8.172 and 8.180.

### 3. La Laja de Cabo de Gata

Description: A rock with least depth of 3.3 m over it, lying off Cabo de Gata, a significant landfall on the coastal route round the Iberian Peninsula.

Location: 0.6 nm (1.08 km) SSE of Cabo de Gata

Position: 36° 42′.9 N 2° 11′.3 W

First written reference: *Lo compasso* (3 v 11–13) mentions a sunken rock, but states that it lies 2 'millara' offshore.

First noted appearance on a portolan chart: The Carte Pisane shows a dangerous rock symbol.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows a rock awash symbol.

Smyth reference: Listed on 332 as ‘*the outer shoal off Cape Gata*’, which ‘was noted by the earlier hydrographers’.

Reference in modern charts and Sailing Directions: BA 774; NP 45 Mediterranean Pilot Vol. 1 (16th Edition 2018), 96, paragraph 2.69.

### 4. Vigia in the Sardino-Balearic Abyssal Plain called the ‘secha de mantello’

Description: This sea area was known from ancient times to be abyssal. Strabo (Book 1, chapter 3:9) refers to ‘the sea of Sardinia, than which a deeper sea has never been sounded, measuring as it does, according to Posidonius, about 1000 fathoms’. Yet it is here that most of the vigias on the portolan charts are shown, rather than in the Tyrrhenian Sea, described in the Admiralty Pilot as ‘amongst the principal seismic regions of the world’, where seamounts of volcanic origin extend from the Isole Eolie to the latitude of Vesuvius. The seamounts to the westwards and north-westwards of Sardinia and Corsica do not have depths less than 2,000 m over them. They may nonetheless have been active in medieval times, with floating pumice causing the appearance of a shoal. The vigia that can be tied most closely to a seamount on the modern chart, with a least depth of 1,980 m, is that called the ‘secha de mantello’ shown S of Cap Sicié [*c.cercelli*]. A vigia in similar latitude but further to the W, in the Gulf of Lyons, well to seawards of the Rhône delta, is shown on an edition of Norie’s chart of the Mediterranean as late as 1852. It is described as ‘Roche Molle Bank of 60 fathoms said to lie hereabouts’. ‘Roche molle’ may refer to a sand bank, though Espinosa (1811) translates it into Spanish as ‘Placer de Piedra Blanca’.

Location: 36 nm (66.5 km) S by E of Cap Sicié.

Position: 42° 27′.5 N 5° 59′.5 E

First noted appearance on a portolan chart: First shown and named by B. Beccari in 1426, (but probably introduced by F. Beccari after 1403); still there in 1639.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows a rock awash symbol with the legend written to southwards.

Smyth reference: None.

Reference in modern charts and Sailing Directions: BA 1974; NP 46 Mediterranean Pilot Vol. II (15th Edition 2016), 12, paragraph 1-78.

## 5. Secchi della Meloria

Description: An extensive shoal in the approaches to Livorno with a least depth over it of 1.2 m near the lighthouse tower at its southern end. The given position is for this least depth.

Location: 3 nm (5.5 km) W by N of the entrance to Livorno harbour.

Position: 43° 32'.9 N 10° 13'.05 E

First written reference: *Liber (meliora siccum* – line 1761) and *Lo compass* (14v 4)

First noted appearance on a portolan chart: The Carte Pisane shows three dots and the Cortona chart a dangerous rock symbol.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows a red shaded shape to depict the main bank with adjacent dangerous rock symbol and black dots, possibly to indicate the isolated shoal patches that lie around the bank.

Smyth reference: Listed on page 333 as ‘the Melora off ‘Ligorne’ with a comment that it appears distinctly in the Egerton MS. 73 of c.1489 (i.e. the collection of copied 15th-century charts in the Cornaro Atlas).

Reference in modern charts and Sailing Directions: BA 119; NP 46 Mediterranean Pilot Vol. II (15th Edition 2016), 187, paragraph 5.48.

## 6. Secche di Vada

Description: A rocky shoal off the port of Vada with a least depth over it of 2.2 m, for which the position is given below.

Location: 3.6 nm (6.7 km) WSW of the lighthouse on the pier at Vada.

Position: 43° 19'.3 N 10° 21'.5 E

First written reference: Kretschmer (p. 297) cites the mid-15th century Parma *portolano* for the name *seche ualuedro*.

First noted appearance on a portolan chart: The Carte Pisane shows two dots and the Cortona chart a dangerous rock symbol.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows a rock awash symbol. Capacci (No.18214) refers to Michelot & Bremond’s atlas of c.1730.

Smyth reference: Listed on page 333 with a comment that it appears distinctly in the Egerton MS. 73 of 1489.

Reference in modern charts and Sailing Directions: BA 1998; NP 46 Mediterranean Pilot Vol. II (15th Edition 2016), 193, paragraph 5.95.

## 7. Scoglio Africa

Description: A rock, 2 m high, on the Formiche de Montecristo, on the eastern flank of the Corsican Channel linking the Ligurian and Tyrrhenian Seas. There are numerous other



submerged rocks and dangers around the rock and a dangerous shoal with a least depth over it of 6 m lies at the N end of the Formiche.

Location: 10.1 nm (18.65 km) W by N of Isola di Montecristo

Position: 42° 21'.5 N 10° 03'.85 E

First written reference: *Lo compass as formigue* (15r 14, 81v 3)

First noted appearance on a portolan chart: from 1311 Vesconte has the legend 'formiche' near three red symbols, which may also include the nearby islands.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows the rock as a circle shaded red and surrounded with a circle of dots and a legend 'formiche'. Diego Homem in 1559 (Bib. Nat. de France, DD 2003) shows the same with the rock as a blue shaded shape. Both show a dangerous rock symbol to the NE which may represent the dangerous shoal. It remained on the portolan charts, e.g. as *formicoli* on the 1677 Cavallini atlas.

Smyth reference: Listed on page 333 as '*The Africo rock off Monte Christo*' with a comment that it 'is well marked by Benincasa and others'.

Reference in modern charts and Sailing Directions: BA 1999; NP 46 Mediterranean Pilot Vol. II (15th Edition 2016), 245, paragraph 8.14.



Figure 6a. Benincasa's depiction.

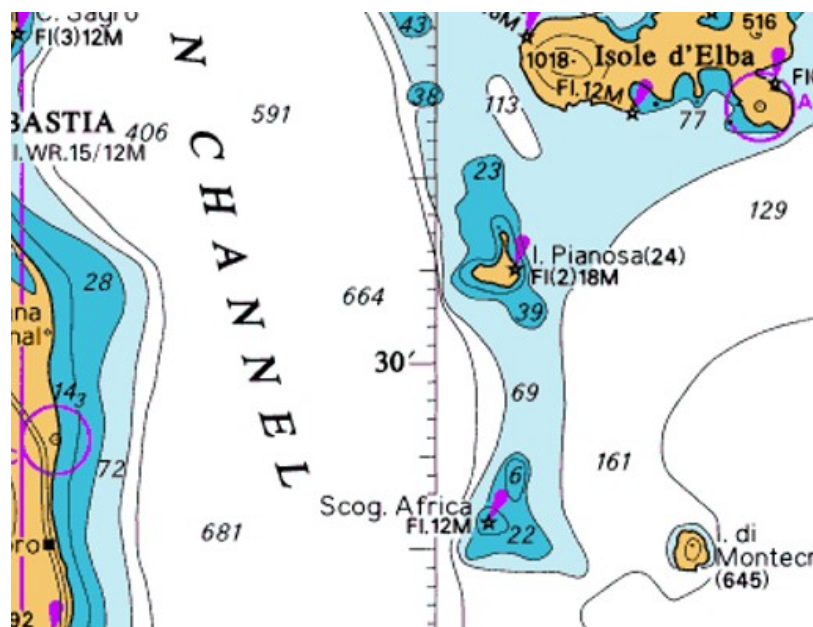


Figure 6b. Depiction on BA 1999.

## 8. Otok Jabuka (Pomo I.)

Description: An isolated islet some 96 m high with a shoal of least depth 6.5 m lying 1¼ nm to the WNW. The given position is for the islet. These dangers lie on the flank of the route through the Adriatic Sea.

Location: 26 nm (48 km) W of the island of Vis [*lissa*].

Position: 43° 05' N 15° 27'.5 E

First written reference: Benincasa's *portolano* (1435-45) (mis-identified by Kretschmer (633) as Brusnik Island or St Andrea).

First noted appearance on a portolan chart: The Carte Pisane shows the islet with the legend ‘mohzelo’ to the N of the island labelled ‘sco andrea’, which was the old name for Otok Svetak. The 1313 Vesconte atlas shows the island in the same position, as a red-shaded circle, labelled ‘millo’.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows a circle shaded red with the legend ‘meloncello’.

Smyth reference: Listed on page 333 as ‘*Rock Pomo*, off Lissa’ with the comment that it ‘is shown on the early manuscript plans, and is given by Coronelli in the great Atlante Veneto’ [c.1690].

Reference in modern charts and Sailing Directions: BA 2774; NP 47 Mediterranean Pilot Vol. III (16th Edition 2017), 224, paragraph 7.262.

## 9. Ýfalos Áspra Váchia

Description: A reef off Ákra Asprókavos (Cape Bianco) at the south of Kérkyra (Corfu) with a least depth of 1 m, for which the position is given below.

Location: at the southern extremity of Kérkyra (Corfu).

Position: 39° 21'.5 N 20° 07'.3 E

First noted appearance on a portolan chart: Beccari in 1403 depicts the reef as a fringe of black dots and also shows dangers off the W coast of the island.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows a dangerous rock symbol.

Smyth reference: Listed on page 333 as ‘*the reef off Cape Bianco, Corfu*’, with the comment that ‘this appears in several of the portolani, and is very fairly figured by Coronelli’ [c.1690]. It is also depicted clearly by Colom (1661) and Levanto (1664) and in Roux’s plans of ports and roadsteads (1764) which was consulted by Masters in the Royal Navy.

Reference in modern charts and Sailing Directions: BA 205; NP 47 Mediterranean Pilot Vol. III (16th Edition 2017), 139, paragraph 5.18.

## 10. Ifalos Mesokanali

Description: Two shoals each with a least depth of 5 m lying in the N approaches to the strait between the island of Zákynthos [*zante*] and the mainland of Greece. The position below is for the larger shoal.

Location: 7.8 nm (14.5 km) NE by N of Ákra Krionéri, Zákynthos.

Position: 37° 54'.9 N 20° 59'.6 E

First noted appearance on a portolan chart: Beccari in 1403 shows a black dot, though rather closer to Ákra Glaréntza on the mainland Peloponnese than the actual position of the shoals.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows a dangerous rock symbol.

Smyth reference: Listed on page 333 as ‘*the shoal off Cape Chiarenza*, named Montagu by us, on account of the line-of-battle ship of that name having run upon it in 1810, ... is well marked in the old works.’

Reference in modern charts and Sailing Directions: BA 203; NP 47 Mediterranean Pilot Vol. III (16th Edition 2017), 81, paragraph 3.82.

## 11. Vrak Navtilos

Description: An islet, 3 m in height, with a detached nearby shoal with a least depth of 6 m over it, lying NNW of Andikíthera, and other dangers including the Ifalos Vathi with a least depth of 7 m extending northwards into the Strait of Kíthera on a main route into the Aegean.

Location: 3.2 nm (6 km) NW by W of Nísos Andikíthera.

Position: 35° 56'.2 N 23° 12' E

First noted appearance on a portolan chart: Guillem Soler (c.1380) places a group of three small islands surrounded by a line indicating a bank in the centre of the Strait of Kithera.

Subsequent history and latest appearance on a portolan chart: Beccari in 1403 uses black dots to indicate the off-lying dangers on both sides of the Strait of Kithera. The shipwreck of Bontempo [see above] which he plots far to the south west may have taken place on one of these dangers. Benincasa in the 1460s has a dangerous rock symbol in the Strait of Kithera that may relate to this feature. The Vallard Atlas (1547) shows a red shaded symbol for Vrák Navtilos, S of larger similar symbols for Vrák Poreti and Vrák Pori, for which the legends are reversed. Adjacent dangerous rock symbols indicate surrounding dangers, but not the Ifalos Vathi.

Smyth reference: Listed on page 333 as Nautilus Rock, '*the rock off Cerigotto* – on which the *Nautilus* sloop-of-war was lost in January, 1807, and 58 of her crew perished miserably – is marked in the portolani, and omitted in recent charts'.

Reference in modern charts and Sailing Directions: BA 1030; NP 48 Mediterranean Pilot Vol. IV (17th Edition 2017), 55, paragraph 3.23.

## 12. Ifaloi Kéros (Kharos Bank)

Description: A bank extending eastwards from the island of Límnos [*stalimene*] with Vrák Anatoli, a rock with a least depth of 1.5 m near its extremity. The position given below is for that rock.

Location: as described above.

Position: 39° 56'.3 N 25° 34'.6 E

First noted appearance on a portolan chart: from 1313 Vesconte indicates the triangular shape of the bank with a pattern of dots.

Subsequent history and latest appearance on a portolan chart: The triangular shape, which depicts the extent of the bank very effectively, is shown by the Pizzigani brothers in 1373, in the Vallard Atlas, and by Diogo Homem in 1559 (Bibliothèque nationale de France DD 2003). Benincasa in the 1460s (see below) shows a dangerous rock symbol at the extremity of the feature which may represent Vrák Anatoli. Salvatore Oliva shows the feature in 1620, with both Levanto in 1664 and Cavallini in 1677 repeating the triangular dotted area.

Smyth reference: None.

Reference in modern charts and Sailing Directions: BA 1636; NP 48 Mediterranean Pilot Vol. IV (17th Edition 2017), 397, paragraph 10.186.



Figure 7a. Depiction by Benincasa.

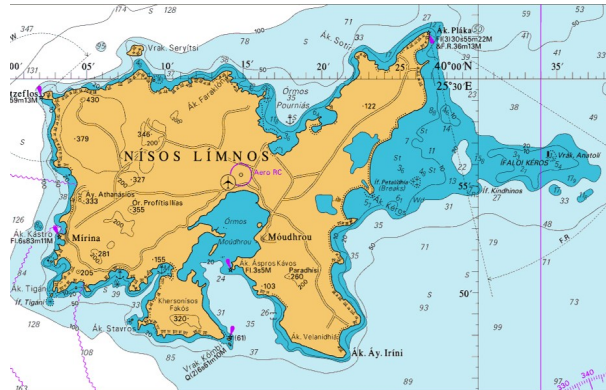


Figure 7b. Detail from BA 1636.

### 13. Gulf of Sirte

**Description:** The mariner's ancient 'fear of being cast ashore in the Syrtis' is conveyed vividly in Luke's account of the voyage of Paul (Acts 27 v.17). The mentions of 'sand-banks' and 'quick-sands' in successive English translations are glosses on the Greek text, almost certainly reflecting awareness of the classical writers' accounts, especially Strabo's, of the dangers for coasting seafarers (Book 17, chapter 3:20). He stresses the instability of the coastline but makes no mention of offshore dangers. An offshore bank, with the legend 'Roselli' or 'Roselle', was shown in a number of charts published at the end of the eighteenth century. Smyth set out to find or disprove its existence during his survey in the early 1820s.

It is conceivable that mariners of the medieval period sounded for such a feature with a deep-sea lead to warn them that they were approaching the low-lying coast. Unless it has severely eroded, it cannot have constituted a hazard. In the reports that Smyth sent back during his survey he states: 'I had heard of a central shoal, to the south of which a ship might anchor', and this may indicate practice in earlier times (see below the legend on the Lucca chart). The only offshore feature shown on the modern chart is a shoal with a least depth of 44 m off the port of Surt in the general area of the symbol on the portolan charts which is discussed below. It is labelled as reported in 1957 and has not been confirmed by a systematic survey.

**Location:** 28 nm (52 km) NE of Surt.

**Position:** 31° 36' N 16° 51' E

**First written reference:** *Liber as sirtes maiores* and *barbarie sicca* (lines 384-5, 414, 421) and *Lo compasso as suecca en barbaria* (63r 17).

**First noted appearance on a portolan chart:** The Carte Pisane, and the Cortona, Riccardiana, and Lucca charts all show a large circle of symbols and the latter has the legend 'Eco est bonu iscasso'. Ramon Pujades (personal communication 21 February 2014) suggests that the name (*oloco* on Carte Pisane, then *sollaco* in the early 15th century), combined with the Lucca

chart's legend above (with the final word meaning 'enjoyment') referred to its safety and shallow depth as a good anchoring place. F. Beccari (the copy in the 1489 Cornaro Atlas) has a central black cross, but with serifs, perhaps indicating that it was not intended as a rock symbol and adding weight to the Pujades interpretation.

Subsequent history and latest appearance on a portolan chart: a circular area of red dots, sometimes with a star shape in the centre, with the legend 'sibecha' or 'xibeca', is common to many portolan charts. Beccari has a star-shaped area of red dots. Benincasa in the 1460s shows a rock awash symbol surrounded with red dots and similar red dots along the coast west of Surt. J. Oliva in 1602 (Huntingdon Library HM40) shows a red-shaded circle surrounded with a star of black dots and with the legend 'xibeca'. He uses the same red shading for features further inshore. The modern chart shows that there is a series of banks with less than ten metres of water over them extending along the coast east of Marsá al Úwayjā, giving substance to the interpretation of the red portions of the symbols as a sand bank. This feature is preserved in the portolan charts as late as 1664 in the chart of F. M. Levanto published in Genoa, where it is shown with the legend 'Sirtis al Zaluco'.

Smyth reference: Discussion on pages 188-90.

Reference in modern charts and Sailing Directions: BA 3402; NP 49 Mediterranean Pilot Vol. V (14th Edition 2018), 78, paragraph 2.131.

#### 14. Gulf of Gabès

Description: The Bancs de Kerkenah extend inshore and east of the islands of the same name and constitute a significant danger to vessels trading to the ports in the gulf. Today the area is marked extensively with buoyage. A bank also fringes the Île de Jerba.

Location: as described.

Position: 34° 51' N 11° 37' E

First written reference: *Lo compasso as, variously, secca de beto, secche de sancta patriarcha, secche de capulia* (54v-56r).

First noted appearance on a portolan chart: The Carte Pisane marks the Bancs de Kerkenah [*berto* and *querquene*] with a line of dangerous rock symbols.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows the Îles Kerkenah as red-shaded shapes and the bank as an area of red dots. The dangerous rock symbols at the extremities are probably diagrammatic and cannot be tied to specific rock features on the modern chart. The bank round Île de Jerba is shown in the same way, though a rock awash symbol SE of the island could indicate the Banc el Biban. These shoals are depicted with lines of black dots on the Cavallini atlas of 1677.

Smyth reference: Discussion on pages 90-1.

Reference in modern charts and Sailing Directions: BA 3403; NP 45 Mediterranean Pilot Vol. I (16th Edition 2018), 321, paragraph 7.167.



Figure 8a. Gulf of Gabès by Benincasa with details below from BA 3403.

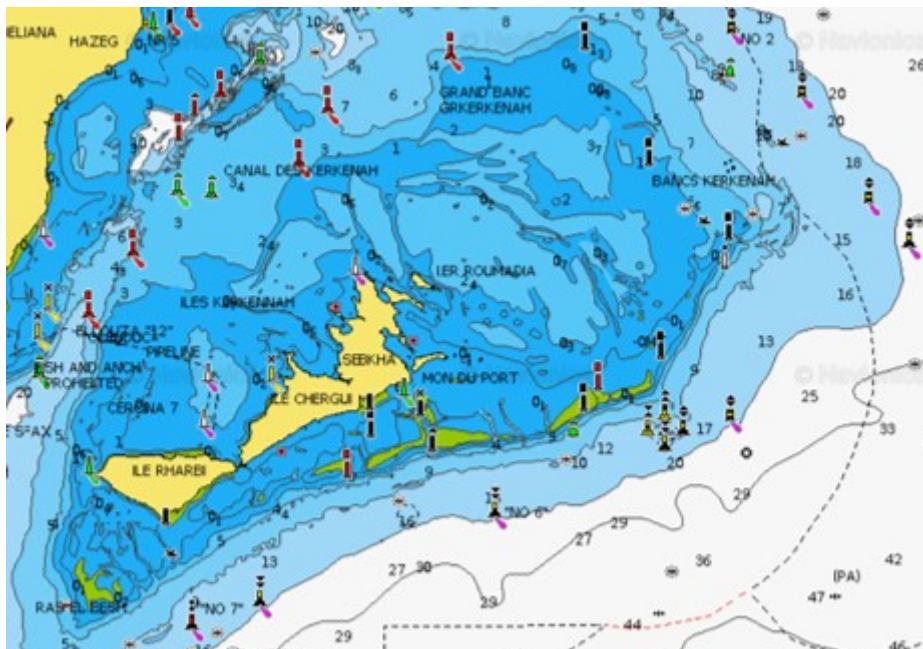


Figure 8b. Bancs de Kerkenah

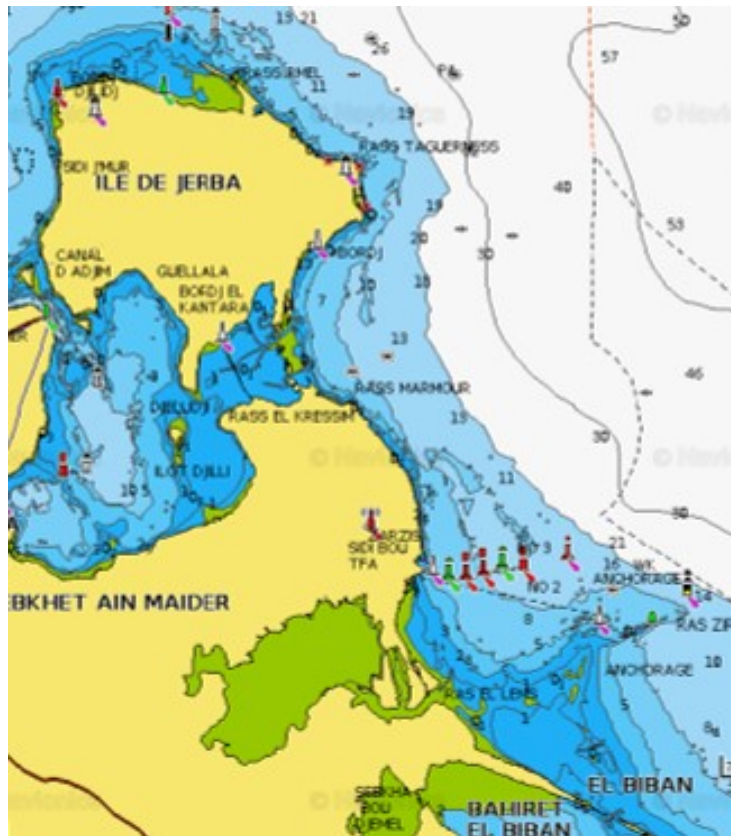


Figure 8c. Jerba and Banc el Biban

## 15. The Skerki Bank

**Description:** A bank at the extremity of the Tunisian coastal shelf, extending for nearly 41 km (22 nm) athwart the W approaches to the Sicilian Channel and with a width of just over 8 km (4.5 nm) at its broadest point. Keith Reef, a limestone ledge with a dangerous rock which generally breaks, is the shoalest point on the bank, and lies in the position given below. Biddlecombe Patch, with a least depth over it of 7 m lies 2 nm to the N. Two other shoal areas lie further away. Hecate Patch (7 m) and Locust Patch (16.5 m) lie close together to the WSW, and Sylvia Knoll (12 m) lies to the ENE. The bank could therefore be described as having three main shoal areas, and thus the depiction on some of the portolan charts is remarkable given that this was not re-established until the advent of steam power and echosounding in the later nineteenth and the twentieth century.

**Location:** 45 nm (83.25 km) N by W of Cape Bon lighthouse.

**Position:** 37° 49'.5 N 10° 55'.7 E

**First written reference:** *Liber* refers to *chilbi* (see comment above); *Lo compasso* provides numerous references to *secche de lo quilbo* or *chilbo*.

**First noted appearance on a portolan chart:** The Carte Pisane and the Cortona chart show a dangerous rock symbol with the legend *quilbo*.

**Subsequent history and latest appearance on a portolan chart:** Soler in c.1380 shows a group of large and small dots. Beccari in 1403 presents three distinct circular shapes with a triangle of black dots extending to the NE. Benincasa in the 1460s has a striking depiction with three shaded red circles joined by lines and a line of black dots enclosing a larger area to the N.

The 1547 Vallard Atlas shows three separate red-shaded circular shapes with surrounding dots, Salvatore Oliva (1620) has the three red circular shapes, and Miguel Prunes in c.1640 (Palau March, Palma) also shows three distinct circular shapes with the legend ‘querqui’.

Smyth reference: Listed on page 334.

Reference in modern charts and Sailing Directions: BA 2122; NP 45 Mediterranean Pilot Vol. 1 (16th Edition 2018), 333, paragraph 8.8

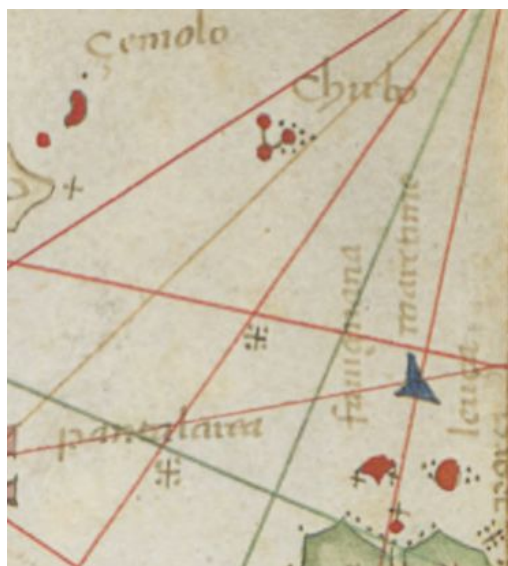


Figure 9. Benincasa’s depiction of the Skerki Bank

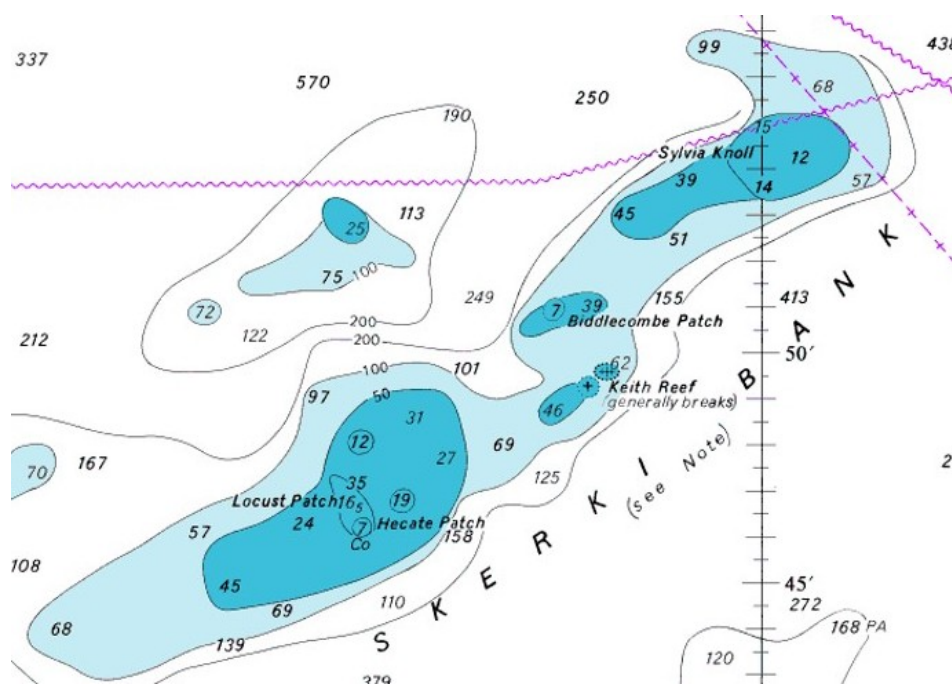


Figure 10. Detail from BA 2122 showing three main patches as depicted by Benincasa and other portolan chart makers. Sylvia Knoll was surveyed by Commander Dawson in 1885, Mr Biddlecombe surveyed the patches named after him and his ship *HMS Locust* in 1841. Hecate Patch was located and surveyed by Commander Robinson in 1974.



## 16. Écueils de Sorelle

Description: Two breaking rocks at the tip of the long reef extending WSW from Île de la Galite. The given position is for the outer rock. This was a very significant hazard in navigation both to and between ports on the Tunisian coast and onwards to the Sicilian Channel.

Location: 16 nm (29.5 km) WSW of Île de la Galite

Position: 37° 23'.9 N 8° 36' E

First written reference: Debanne's edition of *Lo compass* identifies this with *due sorore* (58v 11) a nearby toponym found on the Carte Pisane and other early charts.

First noted appearance on a portolan chart: The Carte Pisane shows three crosses (next to the name *galaira* and the Cortona chart includes a large open shape. The Lucca chart has four crosses.

Subsequent history and latest appearance on a portolan chart: Benincasa in the 1460s shows a dangerous rock symbol and two rock awash symbols extending to the west of Î. de la Galite. J. Martines in 1572 (National Maritime Museum P6(10)) shows two red shaded circles for the islets called Galitons de l'Ouest and a line of four dangerous rock symbols to depict the reef extending to the W. Salvatore Oliva in 1620 shows the Galitons in the same way with dots to indicate the reef. Cavallini in 1677 uses only a dangerous rock symbol.

Smyth reference: Listed on page 334 as '*the Sorelle reef, off Galita*' with the comment 'I had given the name of Sorelle to the two heads of this dangerous rock – which are nearly on a wash with the water – because they lie opposite to the high rocks on the coast of Barbary called Fratelli (*Neptuni aræ*); but, singularly enough, I have since found that the latter went by the designation *do Soror*; see the chart of B. P. Sina, 1488 [i.e. Benedetto Pesina's signed chart of 1489 in the Cornaro Atlas], and other middle-age hydrographers.'

Reference in modern charts and Sailing Directions: BA 2121; NP 45 Mediterranean Pilot Vol. 1 (16th Edition 2018), 296, paragraph 7.12.



Figure 11. Benincasa's depiction.

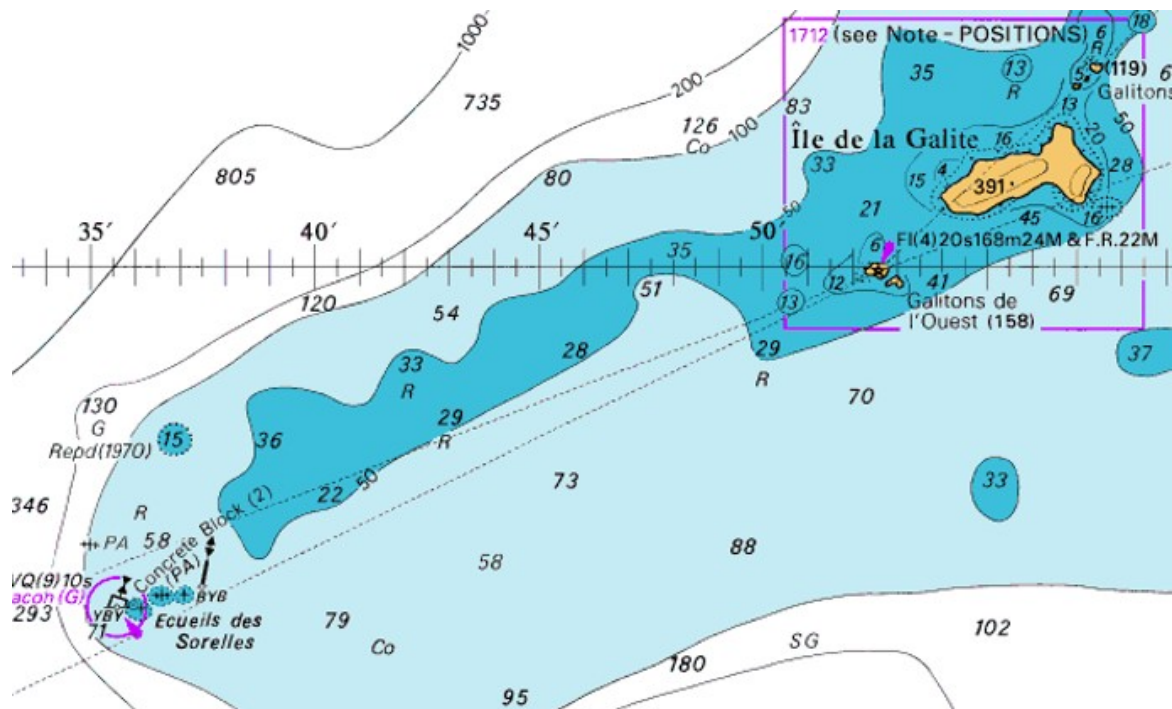


Figure 12. Detail from BA 2121

## Acknowledgments

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