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# Diocletian's Prices Edict: the prices of seaborne transport and the average duration of maritime travel

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The exact conditions, scope and effects of the promulgation of Diocletian's Prices Edict, issued in A.D. 301 between November 20 and December 10, remain much discussed. According to the Preamble, the Edict is to be considered part of the global re-organization of State and society made possible by the recovery of civil and external peace in 299, as well as being an effect of imperial *providentia*. The Edict was intended to repress the *avaritia* considered the main cause of an unequal and huge increase of prices. It introduced the Tetrarchs as universal benefactors in repairing this calamity by means of new regulation. It established a maximum legal prices for a list of 1300 items, services and wages, and was supposed to be valid within the whole empire,<sup>1</sup> though whether it was published only in the Greek East or in the whole empire is debated (Crawford 1984; Guarducci 1985).<sup>2</sup> Although the 30 extant copies of the Edict all come from 4 provinces within the limits of Diocletian's sphere of authority, because none comes from Bithynia where Diocletian had his capital and because a particular province chose to have either the Latin or the Greek version, provincial governors evidently played a leading rôle in deciding whether the Edict should be engraved in Latin or in Greek and on marble or published in another medium (bronze tables or perishable materials). The emperor and his colleagues were acting in the same way as *episcopoi* or *agoranomoi*, civic *munerarii* of the 3rd c.,<sup>3</sup> but on a world scale in their attempt to regulate prices and build a new order. When the Edict stresses moral aspects, rather than the economic causes of the problems, it is to be considered both an ideological program and a rhetorical construction.

Several scholars (Erim, Reynolds and Crawford 1971; Cope 1977) thought that the Edict was a response to Diocletian's second monetary reform, initiated about three months earlier, which, doubling the face value of the *argenteus*, must have opened the way to a sudden increase in prices; according to the preamble, these could reach 4, 8, or more times what was considered the "normal" amount,<sup>4</sup> becoming a threat of loss of fiscal incomes. It should thus have been composed in a hurry. But the preamble is silent about the matter and considers the Edict a remedy not only against speculation (*avaritia*), but also against the unequal position of provinces with respect to supplies and the cost of living. The Edict attacked speculation (Callu 1969, 405) and was considered part of a global reform of society under the protection of the new *parentes generis humani*.

Other scholars such as S. Corcoran (1996, 215-45), however, consider it the result of a long period of gestation. This should begin to explain the issue of the arbitrariness or artificiality of the prices quoted, and thus address its documentary value. The notion that prices for any item, service or wage could be the same from one part of the empire to another is more ideological than realistic economically, but it gives an idea of how the tetrarchs intended to unify the world they ruled. In such conditions, it is not surprising that known contemporary prices and those listed in the Edict generally fail to produce parallels, and it has been pointed out (Jones 1974, 351) that the prices listed in the Edict were almost entirely arbitrary, either due to supposed hastiness in the composition or because they had to be entirely new. Corcoran's thesis of the Edict's long gestation, the text of which should have been written at Antioch during

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1 *Cohortamur ergo omnium devotionem, ut res constituta ex commodo publico benignis obsequis et debita religione <custodi>atur, m[ax]ime cum e<iu>s modi statuto non civitatibus singulis ac populis adque provinciis, sed universo orbi provisum esse videatur, in cuius pe[ln]icijem pauci atmodum desaebisse noscantur, quorum avaritiam nec pro<i>xitas temporum nec divitiae, quibus studuisse cernuntur, m[iti]gare aut satiare potuerunt.*

2 The only extant fragments found in the West, written in Greek, were discovered at Pettorano sul Gizio (S Italy) and are suspected to have been imported from Greece.

3 Dig. 50.4.18.7.

4 *pretia venalium rerum non quadruplo aut octuplo, sed ilta extorquere, ut nomina <a>estim<ati>onis et facti explicare humanae linguae ratio non possit.*

Diocletian's Persian War, invites us to ask how prices were calculated. Should we admit that "the general scale of prices was arbitrary, but there is no reason to believe that the relation of one price to another was distorted" (Jones, 1974, 351)? The improvements made by the Edict have generally been treated by scholars as part of the supposedly naïve attitude of the Roman government to economic problems, but they were serious, as is demonstrated by the capital punishment inflicted for violating the edict. Just because the prices were artificial, the question of how their rates were calculated is crucial.

### The lists in chapter 35 and their contribution to knowledge of the Edict as a whole

In this context, the concluding chapter (35) of the Edict<sup>5</sup> assumes a particular interest. It is entirely concerned with the cost of water transport, both maritime and fluvial, and provides evidence about (mainly) E Mediterranean shipping routes as far as the Atlantic coasts of Lusitania. The Aezani and Aphrodisias copies of the Edict (Crawford and Reynolds 1979; Erim and Reynolds 1970 and 1973; Reynolds 1989 and 1995) provide the almost complete text of the short version of the chapter, along with extended fragments of the longer, revised version as engraved at Aphrodisias. From a rhetorical point of view the chapter is located at a strategic point, echoing the preamble, inasmuch as it presents the restored unity of the empire thanks to its maritime links and an optimistic picture of the water-borne supplies affected by the rising prices. Alone among all the chapters, this one has been subject to several additions, at least at Aphrodisias. We know at least two versions of this text. The first is given by both the Aezani and Aphrodisias copies. In the Aezani copy it is followed by the letter of Fulvius Asticus (Crawford and Reynolds 1975), then followed by another column whose first letter only is preserved but could be the same as Aphrodisias IX. 51 ff. It is introduced by the formula *ex quibus locis ad quas provincias quantum nauli excedere minime sit licitum* and consists of 47 routes listed by point of origin (Alexandria, Oriens, Asia, Africa, Roma, Sicilia, Nicomedia, Byzantium). Every shipping lane is characterized by both place of origin and destination, both being either a city (Alexandria, Aquileia, Byzantium, Ephesus, Nicomedia, Roma, Salona, Sinope, Thessalonice, Tomis, Trapezunta) or a whole province or region (Achaia, Africa, Baetica, Dalmatia, Gallia(e), Lusitania, Pamphylia, Phoenicia, Sardinia, Sicilia, Oriens, Spania), but return lanes are not distinguished by special fares and/or by a reverse listing. The order of the destinations is less clear than that of the places of origin (see below). Maximum fares are expressed in *denarii* per single volume unit, expressed in *modii kastrenses*, equal to 1<sup>1/2</sup> Italic *modii* (Duncan-Jones 1996). The list is followed by a conversion table into *modii kastrenses* of humans and several animal categories (oxen, pigs, cows, mules and horses) and, finally, by the calculation scale for prices of fluvial transport, expressed in *denarii* per 10 Roman miles. Then comes the letter of Valerius Asiaticus.

The Aphrodisias version (Reynolds 1989, 301-11) added to this text a second list (called by Reynolds XXXV A i), of which only the end, starting with routes from Sicily, is preserved. It is an extension of the previous list whose entries are preserved, with the addition of 8 new ones at the very places where they would have been expected if written in the previous list. The precision *praeter onera fiscalia quae formam suam optinent* has been added in some cases, and is always associated with routes to Rome. The list is followed by the cost of freight, per 1000 *modii kastrenses*,<sup>6</sup> between Ravenna and Aquileia, along the so-called *Septem maria* system, and concludes with a new writing of the paragraph on river transport<sup>7</sup> in which a distinction between the costs of upstream and downstream river transport was introduced, with the puzzling precision *et uictus*, probably meaning that feeding the crew could be charged in

5 Chapters are numbered after Giacchero, as revisited in ZPE 34 and by J. Reynolds (1989).

6 This figure is unique in the edict. Equal to 1500 *modii italici*, it seems too small to express the standard tonnage of the ships involved.

7 The first version (XXXV 51) reads: *item in nauibus amnicis per singulos modios per mille passus viginti denarium unum et uictus*; and the second (XXXV A): *item in nauibus amnicis, praeter frumenta fiscalia quae ex singulis [?horre]is [?transportan]tur quaeque formam suam optinent, per milia passus viginti fluium aqua discendentis per singulos modios denarium unum, aqua ascendentis per milia passus viginti per singulos modios denarios duos et uictus*.

addition to the price in *denarii* mentioned in the Edict. Fragment XXXV A ii also repeats parts of the first list, from 'ab Oriente Salonam' to '[ab Asia ad Dalmatiam]', but fares to Rome have been omitted and new entries (now unidentifiable) were added. It contained some restrictions perhaps related to the transport of special products such as oil. It is uncertain whether it was part of the same revised list as XXXV A i. Four other fragments (XXXV A iii-vi) give similar lists of sea-routes, but it is not clear whether they were part of the same list as XXXV A ii or of one or a number other lists. XXXV A iii-vi are so fragmentary that it is difficult to gain any idea of their relationships with the previous ones. They seem to present sequences similar to those in A i and ii, with additions but also suppressions; the formula *praeter species fiscales quae formam suam optinent*, which differs from that found in XXXV A i (*praeter onera fiscalia*), suggests that they did belong to a third list, although in view of the mutilated state of the fragments it cannot be proven.

Usable evidence collected from the two (or more) versions — namely, a text sufficiently preserved to associate a point of origin, a point of destination and a rate — brings the total to 49 sea-routes out of 91 mentioned in the text, covering the whole Mediterranean, part of the Black Sea as far as Tomis and Trapezunta, and the Atlantic as far as Lusitania.

The structure of chapter 35 as a whole, even in its first version, has not yet been studied in detail, but it seems possible to draw from it some elements to support Corcoran's view. First, while the list of points of origin in the Latin version apparently lacks any logical order (Alexandria, Oriens, Asia, Africa, Rome, Sicilia ...), once turned into Greek the list is clearly alphabetic. Thus it seems likely that this chapter, and probably the Edict itself, was first conceived in Greek, as Corcoran thought, and so in the East. Even more interesting are the exceptions to this Greek alphabetic order at the end of the list, after Sicily, where one finds Nicomedia and Byzantium, in exactly the same order as in the first lines of the chapter.<sup>8</sup> Both appear to be additions to a list which ended with Sicilia. This supports the view that the Edict had been prepared before Diocletian's establishment in residence at Nicomedia, and that the last two entries were added later, when Nicomedia, absent from the earlier lists, became Diocletian's capital and was granted a new position in the lists immediately after Rome at the start of the chapter and as the point of origin of 8 shipping lanes. There seem thus to be at least three layers in the gestation of this chapter:

1. A first list, written before promulgation of the Edict, from which Nicomedia was excluded, and Byzantium too;
2. The list whose text is given by both the Aphrodisias and Aezani copies (the one published by the end of 301, when Nicomedia had acquired, after the emperor's return and not before 299, the full status of imperial residence);
3. The second list at Aphrodisias (XXXV A), which added, with the new version of the paragraph on river-transport, at least 8 new entries:
  - a. A route from Sicily to Genua placed after the route from Sicily to the Gauls;
  - b. Four routes from Sardinia (to Rome, to an unknown place, to *Genua*, and to *S[---]*), placed after Sicily probably for topographical reasons;
  - c. Two routes (listed after those from Sardinia and before those from Nicomedia) to Rome from unknown places;
  - d. A route from Nicomedia to *[---]am* inserted in the former list between the routes from Nicomedia to *Salona* and to *Pamphylia*.

If we turn to the names of places and provinces, at first sight they should seem to be related to the new Diocletianic provinces, but this view does not withstand close examination. The distinction made between *Oriens* and Alexandria, being part of the Diocletianic *Diocesis Orientis*, shows that *Oriens* here does not mean the Diocletianic diocese but the Syro-Phoenician coast. The names of the Spanish provinces lead to the same conclusion: we find only the three old provinces (*Tarraconensis*, *Baetica*, *Lusitania*), the new Diocletianic *Karthaginiensis* being omitted, as are *Gallaecia* and *Mauretania Tingitana*. Insofar as it is possible to draw from the shipping rates a reconstruction of the extension of the regions named "Africa" and "Asia", this

8 *Ab Alexandria Romam; Ab Alexandria Nicomediam; Ab Alexandria Byzantium.*

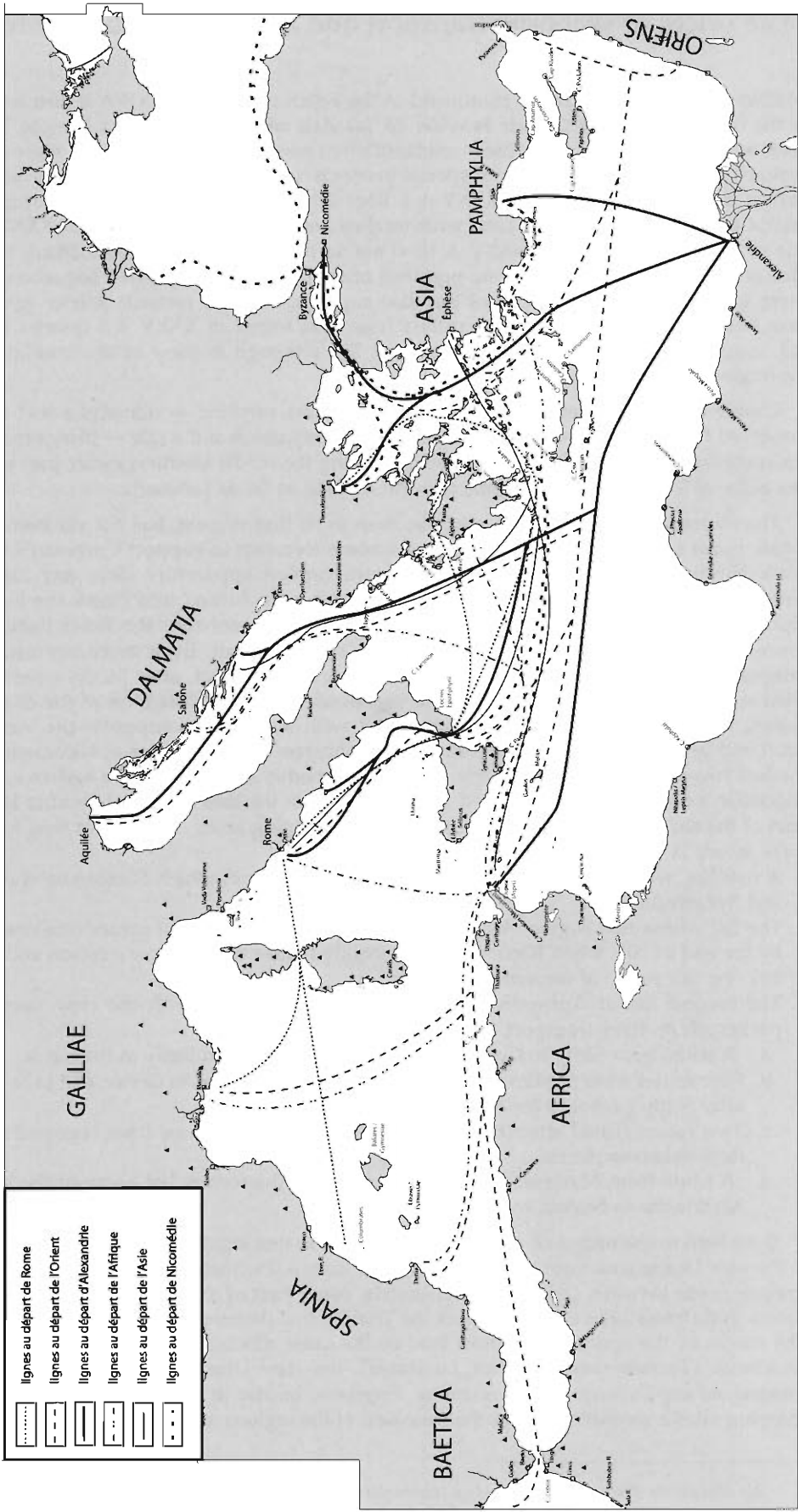


Fig. 1. The routes of the Prices Edict according to J. Rougé, redrawn by P. Arnaud.

appears to fit much better with the pre-Diocletianic provinces than with the Diocletianic dioceses or provinces. *Galliae* (or *Gallia*) is obviously not the *Diocesis Galliarum* (for this did not include the shores of the Mediterranean, all of which belonged to *Viennensis*), but simply a geographical term.

The internal evidence gives support to Corcoran's view of a long period of gestation of this part of the Edict, begun perhaps as early as 297 and the Fayum campaign. Haste can hardly then be invoked to explain a possible — and indeed actual (see below) — artificiality of pricing. On the contrary, the additions made on the Aphrodisias copy show that the rate-system in the first version of the edict was considered so satisfactory by the government that not only was the first list left unchanged, but the system was extended to a new set of routes. The only correction to the previous list was the change of the ambiguous name *Spania* into the more precise *Hispania Tarraconensis*. Most additions were either legal precisions, such as the mention *praeter onera ficalia* (or *species fiscales*) *quae suam formam optinent*, essential for the protection of fiscal privileges, or new lanes omitted from the first version and made necessary by the lack of any measuring system such as the one used for river-borne freight prices, as part of a vain effort to achieve an exhaustive list of sea-routes. The addition of this second list at Aphrodisias suggests that the reason for the complications of such a list, when a simple ratio per *tot millia passuum* could have been expected, is not rhetorical at all, for the first list should have been sufficient for that purpose.

How, then, were these rates actually calculated, and what kind of relationship existed between that list and the actual conditions of sailing? What is the documentary value of this evidence? If it is as arbitrary as other prices in the Edict, it probably will not provide any global idea of the cost of water transport in the early 4th c. But if we can find the key to the principles which permitted the calculation of each and any of these rates, we should be able to gain new evidence about the routes themselves.

### Sea-routes and navigation

Long ago J. Rougé provided a map of direct Mediterranean sea-routes (fig. 1), and the main problems raised by this chapter were at least clearly set out and stressed (1967, 88-89, 97-99), though not solved. R. P. Duncan-Jones (1974) used its data in an attempt to compare the average costs of maritime, fluvial and land-transport, but he misunderstood the reality of classical sea-routes and the nature of the data contained in the Edict. He also misunderstood the meaning of the unit, which did not imply any particular reference to corn transport, for the Latin *modius* or Greek *artaba* was simply the normal gauge unit of freighters.<sup>9</sup> Corn, whose weight per *modius* was otherwise known, was the necessary common denominator between the weights involved in prices for land-transport and the volumes involved in rates for waterborne traffic. But this common denominator was not pertinent. Chapter 35 is entirely concerned with waterborne transport, by sea or by river (and, in the Aphrodisias additions, lagoons) and not with the cost of transport as a whole. Land transport had been treated elsewhere (chapt. 17: *De vecturarum mercedibus*) and in a different way. The prices of transport used to be ruled by their own logic, different from one another: land transport was concerned with weights and distances, river transport with volumes, distances and stream, sea transport with volumes, each route being a case unto itself. The price for land transport was considered a salary (*merces*), that for water transport (*naulum*) the hire of a specified volume in a ship's hull from one point to another (*Dig.* 14.2.1; 50.5.3).

Both Rougé and Duncan-Jones mostly had in mind that direct connections over the shortest distance was the basic pattern. Duncan-Jones tended to postulate a direct relationship between fares and distances (the straightest journey measured on modern maps or on Lloyd's insurance

9 Wallinga 1964; Rougé 1968, 235-36: *Her. Alex.* 18, 22-23 (*Metrologi scriptores* [ed. Hülsch, vol. 1] Leipzig 1864); *P. Bingen* 77, dated A.D. 116, expresses tonnage in *artabae* (Heilporn 2000). Procopius (*B. Vand.* 1.11.2) estimated Belisarius' fleet's tonnage in *medimni* converted from Roman *modii*. A *Novella* (2.8) of Theodosius II dated 439 similarly used the Roman *modius* as the normal gauge unit even in the Orient.

tables), and only later faced the problem of durations of travel. The idea that ancient sailing was much faster than mediaeval, with a general pattern of direct sailing across the open sea (also L. Casson's view) prevailed until the last two decades. Since the late 1980s, the question has been revisited, with the conviction that the nature and conditions of pre-modern sailing were roughly identical and that patterns drawn from mediaeval sailing should be valid for classical antiquity. This has opened the way to a renewed interest in sailing times, seasonality and connectivity, and has led to a re-evaluation of coasting or tramping, now considered the main pattern of pre-modern sailing (both ancient and mediaeval).<sup>10</sup>

In this re-evaluation there has probably been some exaggeration of ancient *cabotage*. Within the Mediterranean, any shipping lane starts and finishes with coasting; further, the orientation of coastlines and archipelagos and the direction of winds often make coasting (and sometimes even tramping) the most direct course between two points, and the most convenient one too. Certainly the figures contained in *P.Bingen 77* (Heilporn 2000) can be explained, to a large degree, by daylight coasting, and so by tramping.

But there are strong arguments against reducing ancient seafaring in general to the supposed mediaeval pattern; and even to reduce mediaeval seafaring to coasting because of a technical or cultural constraint seems unwise. Mediaeval coasting actually appears to be more related to specific trade patterns than to technical limits; if one looks at travel for pilgrimage instead of trade routes (Petti-Balbi 1996), one finds the same durations as those reported by ancient writers, which are much faster than the normal mediaeval durations for trade. Whether tramping was the main pattern of ancient trade is thus debated: some (e.g., Reynolds 1995, 126-36) think that it was; others (e.g., Nieto-Prieto 1988), relying upon the composition and disposition of shipwreck cargoes, have considered the route from warehouse harbour to warehouse harbour the normal one in the classical world.

Ancient writers did not consider coasting a normal sailing pattern, and generally held coasters such as *actuaria* in disdain. As early as Homer (*Od.* 9.128-29 and 322-23), the *phortis* (trading ship), well distinguished from other ships, was the one that crosses the seas, helping make the distinction between the civilized Greeks and the primitive Cyclops. At *Odyssey* 5.250 ff., Calypso teaches Ulysses how to sail by night on the open sea with the help of the stars, out of sight of land. Pliny the Elder (*NH* 8.209) considers navigation by the stars a Phoenician invention, thus a very old one. Eratosthenes (in Strabo 1.3.2, C 48) could write that 'the earliest Greeks made voyages for the sake of piracy or of commerce, not indeed in the open sea, but along the coast', and therefore considered coasting an outdated and primitive practice, balanced by contemporary sailing at open sea. Long before the Roman Empire, coasting was no longer considered a constraint, whether technical or commercial. Long-range 'direct' relations are also suggested by the map showing where traders from known cities such as Nicomedia (Bounegru 2006) settled.

On the other hand, the earlier notion that the basic pattern of ancient shipping-routes was direct sailing at open sea appears to be a triple anachronism, first because the ancients do not appear to have had any clear idea of what the actual distances were at open sea, then because they had no clearer idea of what could be the most direct route (geometrically speaking) between two remote places, except for a very small number of "opposite" places supposed to lie on the same meridian, and thirdly because one can hardly imagine how the lack of instruments would have permitted the sailor in the harbour of departure to find the right direction towards his final destination. Even if we allow that coasting was not the only nor the most common pattern of Imperial-age seafaring, reducing a sea route to the shortest measurable course between two points is almost certainly contrary to what really constituted a shipping-lane in antiquity.

Yet ancient geographers provide unexpected evidence for trying to conceive what shipping-lanes actually should have looked like. About 15 years ago, it was shown that the Greeks' mathematical construction of the presentation of the inhabited world relied mainly on a set of

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10 P. Reynolds 1995, 126-36; Horden and Purcell 2000, 133-43, with many nuances.

measurements made by sea. These were not achieved by means of any instrument measurements (ἐπιτεχνήσις), but using a customary (συνήθεια) elementary table of conversions from durations to distances expressed in *stadia* (Marc. Her., *Epit. Per. Menipp.* 1.5 = Müller, *Geographi Graeci Minores* I, p. 568, 5; Strab. 2.5.1, C109). Herodotus (4.85-86) pretended to be the inventor of the first such conversion table, which evaluated a single day's trip at 700 *stadia* and a night's trip at 600 *stadia* (Arnaud 1992 and 1993). Somewhat later, the 24-hour *nykthemeron* (used by pseudo-Skylax as the normal geographical measurement unit together with the daylight-journey) was fixed at 1000 *stadia*. The three key-values of 600, 700 and 1000 *stadia* remained unchallenged until the end of the classical world, except for a short-lived Roman system of measurement of 100 miles per 24 hours (apparently derived from the Greek one through a convenient 1 : 10 conversion ratio from the Roman mile into the Greek *stadion*). Geographical presentations of distances thus relied upon the experience of seafarers. This new evidence, composed of 125 usable pieces of data for the Mediterranean, revealed not only an unexpected collective memory of time and space concerning maritime travel, but also a kind of map (fig. 2) of Mediterranean shipping routes collected mainly from Classical and Hellenistic experiences of seafaring (see Arnaud 2005).

This kind of map confirmed most of the conclusions drawn by other scholars. When compared with the map of seasonal prevailing winds, it shows that a good number of the shipping lanes were practicable only during very short periods of the year, just like most routes described in the *Periplus Maris Erythraei* where one often finds the mention of the favourable month. Journey out and journey back usually follow different itineraries, at least so far as 'direct' crossings are concerned. But the most striking feature of this map was that it stands midway the two opposite patterns, of coasting and direct sailing at open sea. It was surprising not to find measurements from harbour to harbour but generally from cape to cape, capes forming the hinges between two segments of a route. Shipping lanes thus appeared to be cut into segments whose assembly and combination(s) made up any single route. I proposed calling this "segmented sailing".

Each of the segments has a simple relationship with a cardinal direction or with a prevailing wind, often with both. Such a sailing method is the opposite of modern mathematical sailing, born during the Middle Ages. On one hand, one tries to make the actual route coincide with the theoretical idea of the route. On the other, one knows that, when sailing from a certain point under a certain wind known usually to blow for a duration at least equal to that of the sailing, and with a certain tack (e.g., a quarter wind) and in a certain direction, certain landmarks should become visible after a certain lapse of time (which could be several days) that allow one to wait for a favourable wind. This was probably the most appropriate empirical response to the dearth of instruments, but it was entirely dependent upon the pilot's knowledge of normal wind conditions and of how, under those normal conditions, a wind should carry under a certain tack from one particular place to another.

Literary evidence (Lucan, *BCiv* 8.167-86) shows that, even at open sea, pilots were supposed to know which change of direction would lead the ship to which places or regions, even when these were remote. The only exception was under tempest conditions, when winds change direction and when clouds do not allow sailors to control their general direction by following the stars or the sun. The only limit to this kind of sailing was the permanent or seasonal lack of favourable prevailing winds in certain regions: in those cases coasting was the only alternative solution. The connecting of segments was clearly one of the main problems and the cause for many delays, when at a change of direction a favourable wind had to be awaited.

The new corpus of evidence also revealed an acute collective memory not only of the shipping routes themselves, but also of what were the normal durations for each. What was "normality"? We consider "normal" the itinerary commonly considered by the Ancients the shortest available route between two points — i.e., the one providing the shortest duration one could expect under good, but not exceptional, conditions. This was given as the paradigm for the calculation of the price of any other, less convenient, route between the same points; it should not be considered the average duration. "Normal" should fit better with our argument than "average", for it does not mean an arithmetic median between extreme values, but what was



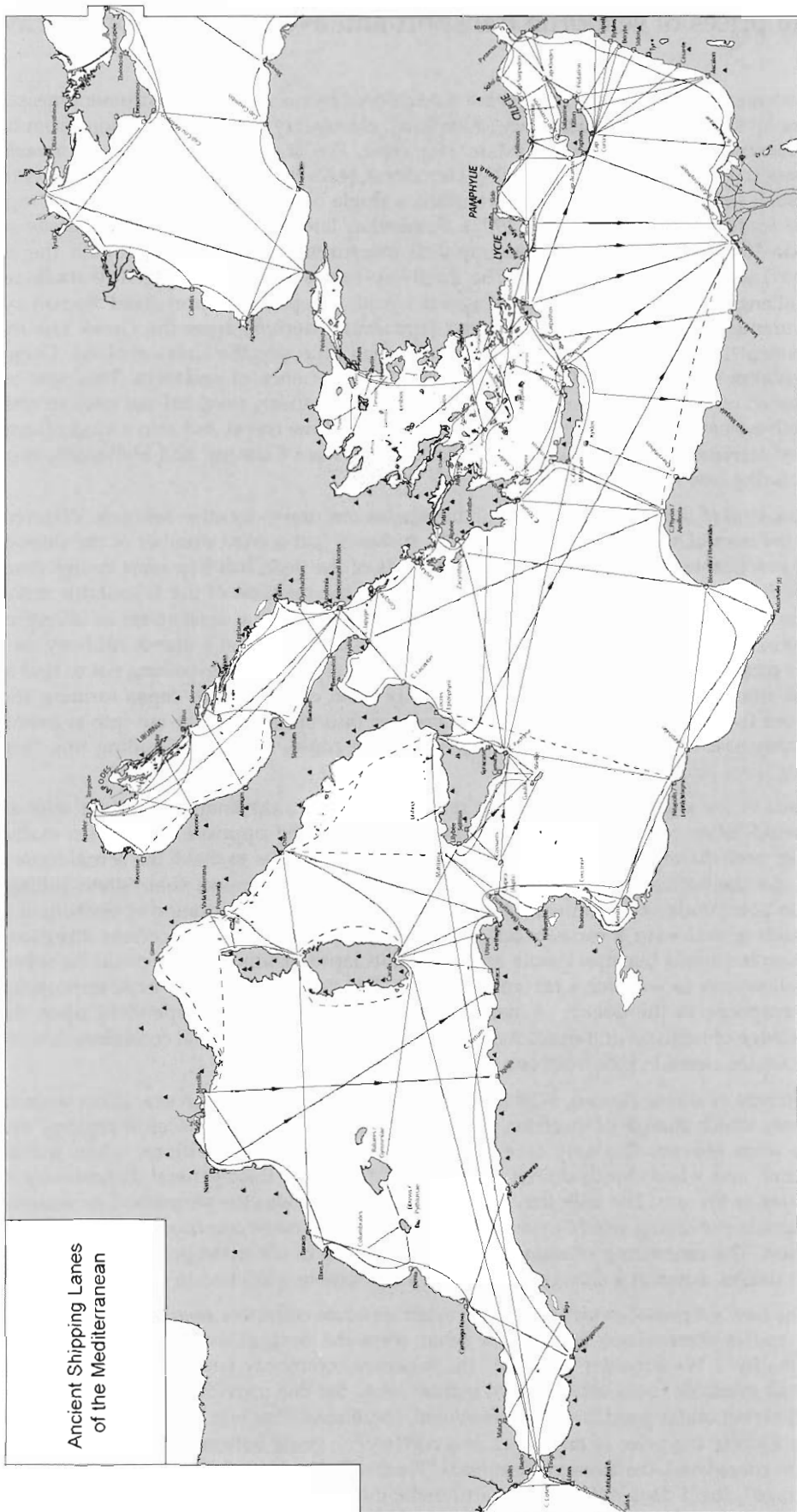


Fig. 2. General maps of ancient shipping lanes in the Mediterranean, after Arnaud 2005.

just considered normal — i.e., what could be reasonably expected when conditions were neither exceptionally good nor exceptionally bad; in other words, the standard conditions during the good season. At least the major routes seem thus to have been associated with such “normal” durations, and the sea-measurements used in mapping the world had their origin in a consensual appreciation of what was, according to the “sailor’s experience” or “testimony” (an expression which occurs often in Strabo, following earlier geographers), the normal duration of the main Mediterranean journeys from the 5th c. B.C. onwards. The duration of maritime journeys was so well integrated into the culture of the day that the simple mention of a travel-duration was enough to let the reader know whether it was above or below normal and whether it was a sign of the gods’ goodwill or the opposite; it thus came to be used by authors as a literary tool.

Unfortunately, this “normality” seems not to reveal the duration of commercial shipping but that of voyages made by individuals, which are more frequently reported. As in mediaeval times, the former must have been much slower, even when individuals travelled aboard merchantmen, first because travellers were not affected by the time spent in commercial operations and tended to step on board just before the sailing. Ancient merchantmen clearly spent more time at harbour than at sea. Individual travellers also used to take advantage of stops to speed up their journey, crossing a cape or isthmus or a difficult sector on foot, to catch another ship in a more favourable area.

In light of the above, do durations hold a key to the calculation of freight rates listed in Diocletian’s Prices Edict?

### Durations and the freight rates of the Edict

As early as 1967, J. Rougé (1967, 98) pointed out that prices bore no relationship to distances, then considered to be the shortest direct route. It can be fairly demonstrated that distances were not directly involved in the calculation of prices of seaborne transport; if they had been, we ought to have found a distance-based rate, such as those encountered with *vectura* or river-borne freight. The ancients had no technical apparatus suitable for the measurement of seas;<sup>11</sup> distances across the seas measured in *stadia* were nothing but conversions of durations into distances.

Two examples show that distances cannot be considered the actual basis of the calculation of prices. Let us look first at the two routes from *Oriens* and Alexandria to the N Adriatic. The prices read as follows:

Alexandria to Dalmatia	18 <i>denarii</i>
Alexandria to Aquileia	24 <i>denarii</i>
<i>Oriens</i> to Salona	16 <i>denarii</i>
<i>Oriens</i> to Aquileia	22 <i>denarii</i>

We find the same difference of 6 *denarii* for the same additional fare between Salona and Aquileia, by a route that must be identical, at least as far as its Adriatic part goes. The extra fare of 6 *denarii* necessary to reach from Salona the foremost recess of the Adriatic is equal to a quarter of the total of that from Alexandria to Aquileia. Yet the distance between Salona and Aquileia is less than one-seventh of the shortest distance and less than one-tenth of the actual

Route	Shortest distance	Fare	Price per 100 n.m.
Africa to the Gauls	430 nautical miles (Massalia to <i>Igilgili</i> )	4 <i>denarii</i>	0.93
Alexandria to Rome	1180 n.m.	16 <i>denarii</i>	1.36
Alexandria to Aquileia	1310 n.m.	24 <i>denarii</i>	1.83
Salona to Aquileia (calculation)	200 n.m.	6 <i>denarii</i>	3
Africa to Sicily	300 n.m. (Carthage to Syracuse)	6 <i>denarii</i>	2
Africa to Sicily	100 n.m. (Carthage to Marsala)	6 <i>denarii</i>	6

11 The machine described by Vitruvius (10.9.5-7) was unable to work in real conditions at sea: cf. Arnaud 1991, 226-27.

distance by the most common itinerary from Alexandria to Aquileia, which runs along the coast of Cyrenaica. If now we try to find a ratio between the prices of the Edict and the most direct distance, there is a similar dispersion of values. Any attempt to establish a stable, normative relation between prices and distances fails. One may rightly object that distances should be calculated not along the straightest route but along the longer effective one. However, even when the shipping route did follow the straightest possible route, the variation factor (from at least 1 to 3) is too high to fit the hypothesis that prices were derived from distances, should those have been measured along the longer itineraries.

The consistency of the additional cost of 6 *denarii* between Aquileia and Salona/Dalmatia is a strong argument that prices were calculated not upon the statement of distances, but on that of the usual travel duration along what was considered the normal itinerary between two points. The Ionian Islands are a difficult and dangerous zone where night sailing was even forbidden in late mediaeval times, forcing ships to stop at night (Petti-Balbi 1996, 278). The slower the sailing, the higher therefore should have been the price.

Using as the tonnage unit the *modius kastrensis* (also used as the capacity unit for cereals in chapt. 1 of the Edict), instead of the usual *modius Italicus* (Wallinga 1964), to rate non-fiscal freight is somewhat puzzling. If the *modius kastrensis* was not used for purely ideological reasons, one can imagine at least two other reasons for it. It could have been a convenient arithmetic ratio between the value of the *modius kastrensis* and those of both the *modius Italicus* and the Greek *artaba*. One *modius kastrensis* was equal to 1.5 *modii Italici*, and to roughly 2 *artabae* (2.22). As the former was the normal gauge unit in the West, and the latter the common one in Egypt, as shown by *P. Bingen 77*, the *modius kastrensis* could have been a convenient bridge between the two systems. But inasmuch as the *artaba* was equal to  $3^{1/3}$  *modii Italici*, there was no significant simplification of the conversion ratio, and as early as A.D. 116 (the date of *P. Bingen 77*) harbour authorities had no difficulty in evaluating in *artabae* a ship that had come from Ostia. The reason for the choice of the *modius kastrensis* must be sought elsewhere. I believe that the reason for the choice of this odd unit, whose value long remained uncertain (Duncan-Jones 1996), was because it allowed to express without change, in *denarii*, the number of days considered the normal duration of any of the routes listed in the Edict. This explanation is supported by its simplicity. It is certainly not the case that, when a comparison is possible between prices in the Edict and otherwise-documented durations of maritime voyages, the figures appear to be very similar. It is striking that the most puzzling figures (Africa to Sicily; Africa to the Gauls) in the Edict find parallels with known durations considered to be normal, given that, as in other passages of the Edict when tiny sums are involved, prices show only even numbers, suggesting that the minimum price unit was not 1 *denarius*, but 2 *denarii*:

Route	Freight rate	Duration	Source	Notes
Africa to Achaia:	12	?		
Africa to Sicily + Sicily to Achaia	6	6	Diod. Sic. 20.6.1-2 Philostr., <i>Vit. Apoll.</i> 8.15	Syracuse to Cap Bon Syracuse to Alpheus river
Africa to Gauls	4	4 5 5.5	Sulp. Sev., <i>Dial.</i> 1.5 Strab. 2.4.3 <i>Geog. Compend.</i> 40 (Müller, <i>GGM II</i> , 105) <sup>12</sup>	Due south from Narbonne to Africa, or Marseilles to <i>Igilgili</i>
Oriens to Rome	18	18	<i>Vit. Mel. lun.</i>	20 days (includes a 2-day voluntary stop to visit a friend at Nola)
Oriens to Byzantium	12	12	Marc Diacon., <i>Vit. Porphy.</i> 55	From Byzantium; 10 days also attested from Byz- antium; <sup>13</sup> from Palestine, 20 days <sup>14</sup>

12 Ptolemy (*Geog.* 2.9; 4.2) estimates at 11°, equal to 5500 *stadia*, the difference in latitude between Marseilles and *Igilgili*.

13 Marc. Diacon., *Vit. Porphy.* 55. In both cases the destination was Gaza.

14 Marc. Diacon., *Vit. Porphy.* 26 (Gaza to Byzantium); 35-37 (10 days from Caesarea to Rhodes, and 10 more thence to Byzantium).

Alexandria to Africa	10		
Alexandria to Phycus		6	Synes., <i>Ep.</i> 51
Lepcis Magna to Benghazi		3	Plin., <i>NH</i> 5.31; ps.-Scyl. 109

### The shipping-routes of the Edict: between practical experience and bureaucracy

Unfortunately, the figures in this Table show that some freight rates fit only with journeys oriented in a direction which is not that supposed by the Edict, but the opposite one: all known evidence shows that the 4-5 days considered as the normal duration between Narbonne and Africa or between Marseilles and Igilgili refer to travels from Gaul to Africa, along a straight line running north to south, whereas the Edict states that the rates are calculated from Africa to the Gauls. Similarly, freight rates between *Oriens* and Byzantium fit well with known figures from Byzantium to *Oriens*, but not with known figures from *Oriens* to Byzantium. On the other hand, the 6 *denarii* rated from Africa to Sicily seem to be rather above the normal unless if we apply it to the journey from Syracuse to Carthage against dominant winds, as described by Diodorus.

In that case, the Edict should stress the difference between fast routes, such as Africa to the Gauls, at 4 *denarii*, and slow ones, such as Rome to the Gauls, amounting to 14 *denarii*. The slower ones are the traditional zones for coasting, by which I refer to the Etruscan and Ligurian coasts in the West, and, in the East, the coasts of Dalmatia and Epirus as far as Pamphylia. The latter is the so-called "northern route", which was the zone *par excellence* for daily coasting (Pryor 1988, 14), the one where almost all the data of 600 and 700 *stadia* (meaning a daily sailing) concentrate (Arnaud 2005, 110-11), from the Gulf of Issus straight down to Epirus.

If we recall that one of the main characteristics of ancient seafaring lies in the fact that outward and return journeys were normally travelled along different itineraries, the Edict appears to be rather far from reality: not only did it pay no attention at all to return routes, but many rates were calculated from durations of voyages made in exactly the opposite direction to that given in the text. In the case just mentioned, the very cheap price of 4 *denarii* is justified along the N-S route running from *Gallia Narbonensis* to Africa, one of the quicker ones in the Mediterranean, but according to the Edict the journey is supposed to move in the opposite direction, northwards from Africa. The northbound shipping route was much slower than the journey south, and it followed more or less the route from Africa to Rome, as is suggested by several shipwrecks. Similarly, the very cheap fare from Asia to Africa (8 *denarii*) indicates a fast sailing, one probably related to a direct route from Lepcis Magna to the southernmost parts of the Augustan province sailed with favourable prevailing winds at the start of summer, but one sailed in the opposite of the supposed direction.

This leads to the conclusion that at least some of the figures in the Edict, if not the whole Edict, were quite artificial. Such a conclusion is not that surprising, for the artificiality of prices in the whole Edict has been noted by several scholars. But in this case it seems to rely upon a huge misunderstanding of, or disregard for, the reality of sailing by the Edict's authors. For example, one can hardly imagine that hiring the same volume on the same route on an oared ship or on a sailing ship, on a small 45-foot ship or on a 600-ton freighter, could really be rated the same price by a typical *nauceros*.

Simplifying was a technical choice made by the authors of the Edict, and it is one of the causes of its artificiality. This was partly the effect of the method used to establish some of the freight rates, for, if we examine some of the figures, it is evident that they are nothing but the sum of two otherwise-known rates. The fare from Alexandria to Rome is equal to the sum of two other itineraries mentioned in the Edict: Alexandria to Sicily (10 *denarii*, equal to Alexandria to Africa) plus Sicily to Rome (6 *denarii*), and the freight rate from *Oriens* to the Gauls (24 *denarii*) is equal to the sum from *Oriens* to Sicily (16 *denarii*) plus Sicily to the Gauls (8 *denarii* as well); similarly, the freight rate from Nicomedia to Africa (14 *denarii*, a very cheap rate compared with that of the route from Africa to Pamphylia, rated at the same price) is equal to the sum of Asia to Africa (8 *denarii*, even cheaper than the previous figure) plus Ephesus to Nicomedia (6 *denarii*). Some of these sums may reflect the pattern of naviga-

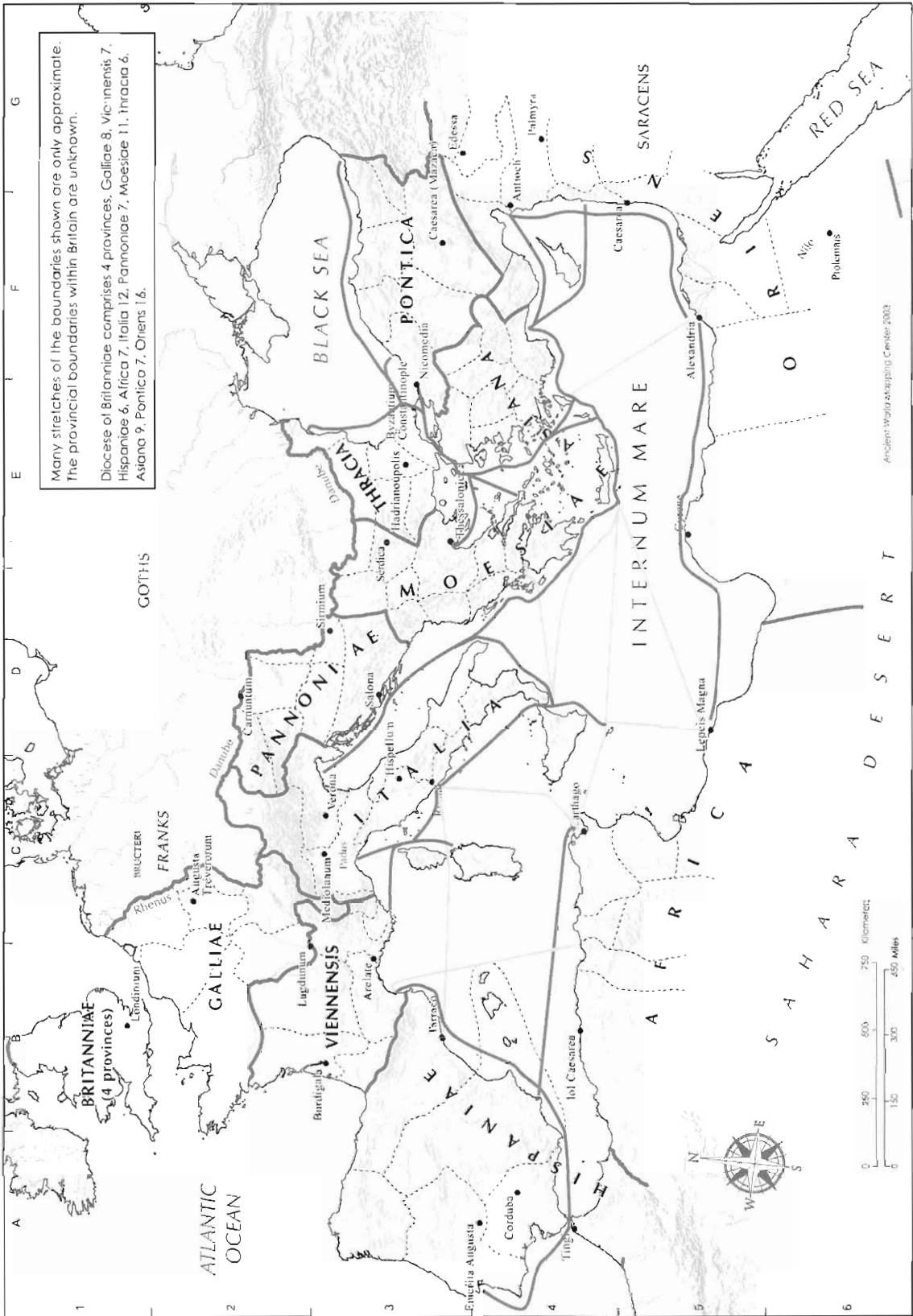


Fig. 3. The shipping lanes of the Prices Edict as proposed by the author.

tion by segments, but some were probably theoretically derived by calculation. The latter figures show the limits of such arithmetical constructions. The freight rate from Nicomedia to Africa is nonsense if it actually relied upon such a sum, and that from Africa to Ephesus too, which is exceptionally cheap if related to the new province of Asia and if Asia is to be reduced to its main harbour (exactly as Dalmatia meant Salona, Spain meant Tarragona, and the Gauls meant Narbonne). Both figures seems to depend upon a confusion between Asia and Ephesus, when Asia in this passage of the Edict actually meant probably Rhodes or Cnidus. That strengthens the opinion that these names did not refer to the new Diocletianic circumscriptions (provinces or dioceses) but to the traditional ones, inherited from the High Empire. Similarly, Africa probably did not mean the same location but some variable place between Lepcis Magna and Sousse as far as the route from *Oriens* to Africa was concerned, and some place between Igilgili and Hippo Regius as far as the route from Africa to the Gauls was concerned.

We are thus dealing with bureaucratic constructions, the documentary value of which is small as far as the study of ancient seafaring is concerned. But the Edict is not without value, and not only because it serves as a witness of the collective memory of sailing times in the ancient Mediterranean. Whatever the explanation for how prices were calculated, the available lists of shipping-routes are enough to show that no count was taken of at least two of the main features of ancient sailing: seasonality, and journeys there and back usually being made along different itineraries. The authors of the Edict appear to have paid no attention at all to the directions of the shipping-lanes they were listing. This probably means that they thought that a sea-route did not exist outside the favourable season, and that they had in mind a pendulum-like, binary model of trade and commerce, from place A to place B, and then back to A, the same freighter(s) being involved in both the outward and return journeys. This is not surprising, for it is the trade-pattern described by Roman legal sources and known by modern scholars as the warehouse-harbour to warehouse-harbour pattern. Some of the figures listed in the Edict appear to be artificial, not because they were the sum of two segments, but because the two segments did not actually fit together: such was the case when Asia (or Africa) was considered as a single place, but actually referred to different, and sometimes remote, places. An unfilled and unmeasured gap was then left between the two summed segments. Yet the idea of the segmentation of the main shipping routes, to create several segments of sailing, was probably drawn from experience.

We can also find in the Edict reliable information about the actual layout of at least some of the main routes of the Mediterranean (fig. 3). Prices to Africa and to Sicily are less expensive from Alexandria (10 *denarii*) than from *Oriens* (16 *denarii*), and they increase from Pamphylia (14 *denarii*) to *Oriens* (16 *denarii*); but prices to Dalmatia are less expensive from *Oriens* (16 and 22 *denarii*) than from Alexandria (18 and 24 *denarii*). Such figures strongly suggest the existence of two different itineraries from Alexandria: a southern route, well-documented by papyrological evidence,<sup>15</sup> along Cyrenaica and the Syrte, thence to Malta and the Straits of Messina. This was a spring or early summer route, whose layout was common to the route from *Oriens* to Africa. The other one was the ordinary one in both mediaeval and modern times: it was nothing but the coasting-route along the shores of Phoenicia and Pamphylia as far as Rhodes, the one followed by Paul the Apostle and later by Chateaubriand, and its importance has been stressed by J. H. Pryor. This route, the one followed by all the small *akatoi* mentioned in *P. Bingen* 77, was known to the ancients as a particularly slow and inconvenient one (Philo, *In Flacc.* 26; Strab. 6.3.7), but it was sailed for most of the year and could be used out of season to reach Rome, the Adriatic or the West, if the "archipelagos" route, through Rhodes, Scarpanto, Crete, the W Peloponnese and Epirus as far as Otranto, was followed. But the route considered "normal" by the Edict, and probably by the ancients, was not the almost year-long one stressed by Pryor, but the seasonal southern one. The former could be the means for a sustainable year-round connectivity, the latter the best vector of trade.

15 *P. Mich.* 490, a letter sent from Rome to his mother by an Egyptian soldier of the Misenum fleet, mentioning a previous letter sent from Cyrene during his journey to Rome.

A comparison between the freight rate from Africa to Achaia (12 *denarii*) and that from Asia to Africa (8 *denarii*) underlines the fact that they are related to two entirely different routes. The former was a segmented one to Sicily, and from there to the mouth of the Alpheus river, which used to be the traditional landing-point for ships from Sicily. The fare from Africa to Sicily is 6 *denarii*, the normal crossing from there to the Alpheus, of 6 days and nights, being equal to 6 *denarii*. The latter was an almost direct route from Lepcis to Rhodes or Cnidus.

Similarly, prices to Africa and to Sicily are equal from both *Oriens* (16 *denarii*) and Alexandria (10 *denarii*). On the other hand, the figures from *Oriens* to the Iberian provinces show a regular progression from Africa (16 *denarii*) to *Tarraconensis* (20 *denarii*, i.e., an increase of 4), thence to *Baetica* (22 *denarii*, i.e., an increase of 6) and to *Lusitania* (26 *denarii*, i.e., an increase of 10). Inasmuch as the rates to *Tarraconensis* are the same as those from Africa to the Gauls, the figures strongly suggest the combination of a route from Africa to *Tarraconensis* with a coasting voyage along the Early Imperial Spanish provinces, from *Tarraconensis* down to Gades. It is noteworthy that the 6-*denarii* difference between *Tarraconensis* and *Lusitania* is equal to the 6 days and 6 nights reported by Greek writers between the Pyrenees (i.e., the edge of the Gauls at the start of *Tarraconensis*) and the Pillars of Hercules.<sup>16</sup>

On the other hand, the prices from *Oriens* to the Gauls (24 *denarii*) could be the sum of the route to *Tarraconensis* plus a 4-*denarii* rate from *Tarraconensis* to the Gauls. The same difference of 4 *denarii* is to be found between the Rome to Spain (i.e., *Tarraconensis*) route (10 *denarii*) and the exceptionally expensive route (14 *denarii*) from Rome to the Gauls, meaning that the route from Rome to the Gauls (once again, meteorological conditions make the crossing westwards much more hazardous and slower than the eastbound one from Tarragona to Rome) was supposed to be part of the route to *Tarraconensis*, via the Straits of Bonifacio. The same 4-*denarii* difference appears between the route from Africa to the Gauls (4 *denarii*) and that from Africa to *Tarraconensis* (8 *denarii*), surely implying that the "normal" route was meant to go first to Narbonne and then on to Tarragona. In both cases this fits quite well with the direction of the route that the redactors of the Edict had in mind, but it does not fit at all with actual meteorological conditions, characterized by prevailing strong NE winds between the Balearic Isles, Corsica and the Golfe du Lion. If one thinks that the price from Sicily to the Gauls, added to that from *Oriens* to Sicily, gives the same sum of 24 *denarii*, it would appear impossible to decide which values were the result of arithmetical calculation, and which were derived from actual routes.

### Epilogue

The Edict thus seems to be a strange mixture of empirical data and of bureaucratic simplifications and (mis-)calculations, relying above all upon an abstruse, arithmetical view of ancient seafaring. This method is very close to that used by ancient geographers themselves, and it is probably justified by the notion of "acceptable error". Each shipping-route being a case to itself, the redactors were unable to find a simple algorithm to fit every situation. As they could not list every one of the shipping-lanes within the empire, by a process of reduction, simplification and calculation they found an acceptable compromise between an impossible algorithm and a never-ending list. This is probably the reason why return fares were excluded from the text, being considered needless duplications.

Whatever the artificiality of the figures in the Edict, they seem to have been inspired by some simple rules. The key was voyage duration. The more a shipping route was segmented, the higher was the price. Cheap itineraries, if compared with the actual distances, are generally the direct ones. The main interest of the Edict is that it refers to a sailing pattern situated midway between the two generally promoted by scholars: on one hand, coasting or tramping, considered by some scholars to be the main pattern of all pre-modern seafaring, and, on the other, sailing at open sea, considered by other scholars to be the particular pattern of ancient seafaring and long-range seaborne commerce. Instead, except for winter journeys or journeys in a

<sup>16</sup> Strab. 2.4.4; 3.4.1 after Erastosthenes. He considers the data consensual.

bad season, and except for specific local meteorological and geographical constraints, neither coasting nor direct sailing at open sea seems to have been the normal pattern of ancient seafaring. Ancient seaborne commerce relied on a small number of segmented routes which associated direct crossings with coasting, with a few technical calls, and it relied upon a network of places (e.g., Cap Bon or Pantelleria) devoted to the transshipment of cargoes and persons from one basin and one meteorological context to another.

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From	to	Freight rate per mod.kast.
Alexandria	Roma	16
Alexandria	Nicomedia	12
Alexandria	Byzantium	12
Alexandria	Dalmatia	18
Alexandria	Aquileia	24
Alexandria	Africa	10
Alexandria	Sicilia	10
Alexandria	Ephesus	8
Alexandria	Thessalonice	12
Alexandria	Pamphylia	6
Oriens	Roma	18
Oriens	Salona	16
Oriens	Aquileia	22
Oriens	Africa	16
Oriens	Spania	20
Oriens	Baetica	22
Oriens	Lusitania	26
Oriens	Galliae	24
Oriens	Byzantium	12
Oriens	Ephesus	10
Oriens	Sicilia	16
Asia	Roma	16
Asia	Africa	8
Asia	Dalmatia	12
Africa	Salona	18
Africa	Sicilia	6
Africa	Spania	8
Africa	Galliae	4
Africa	Achaia	12
Africa	Pamphylia	14
Roma	Sicilia	6
Roma	Thessalonice	18
Roma	Achaia	14
Roma	Spania	10
Roma	Galliae	14
Sicilia	Galliae	8
Nicomedia	Roma	18
Nicomedia	Ephesus	6
Nicomedia	Thessalonice	8
Nicomedia	Achaia	8
Nicomedia	Salona	14
Nicomedia	Pamphylie	8
Nicomedia	Phoenicia	12
Nicomedia	Africa	14
Byzantium?	Trapezunta	18
Byzantium?	?	8

From	to	Freight rate per mod.kast.
Byzantium , Amastris, Sinope	Tomis	8
<b>Sicilia</b>	<b>Galliae</b>	<b>8</b>
<b>Sicilia</b>	<b>Genua</b>	<b>**</b>
<b>Sardinia</b>	<b>Roma</b>	<b>**</b>
<b>Sardinia</b>	<b>?</b>	<b>14</b>
<b>Sardinia</b>	<b>Gênes ???</b>	<b>4</b>
<b>Sardinia</b>	<b>S[---</b>	<b>**</b>
<b>?</b>	<b>Roma</b>	<b>**</b>
<b>?</b>	<b>Roma</b>	<b>2</b>
<b>Nicomedia</b>	<b>Ephesus</b>	<b>6</b>
<b>Nicomedia</b>	<b>Thessalonice</b>	<b>8</b>
<b>Nicomedia</b>	<b>Achaia</b>	<b>8</b>
<b>Nicomedia</b>	<b>Salona</b>	<b>14</b>
<b>Nicomedia</b>	<b>[-----]lam</b>	<b>16</b>
<b>Nicomedia</b>	<b>Pamphylia</b>	<b>8</b>
<b>Nicomedia</b>	<b>Phoenicia</b>	<b>12</b>
<b>Byzantium</b>	<b>Roma</b>	<b>18</b>
<b>Byzantium</b>	<b>[Trapezunta?]</b>	<b>18 (1-)??</b>
<b>Byzantium, Amastris, Sinope</b>	<b>Tomis</b>	<b>8</b>
<b>Oriens</b>	<b>Salona</b>	<b>16</b>
<b>Oriens</b>	<b>Aquileia</b>	<b>22</b>
<b>Oriens</b>	<b>Africa</b>	<b>16</b>
<b>Oriens</b>	<b>Hispania Tarrac.</b>	<b>20</b>
<b>Oriens</b>	<b>Baetica</b>	<b>22</b>
<b>Oriens</b>	<b>Galliae</b>	<b>24</b>
<b>Oriens</b>	<b>Byzantium</b>	<b>12</b>
<b>Oriens</b>	<b>Ephesus</b>	<b>10</b>
<b>Oriens</b>	<b>Sicilia</b>	<b>16</b>
<b>Asia</b>	<b>Africa</b>	<b>8</b>
<b>Asia</b>	<b>Dalmatia</b>	<b>12</b>
<b>?</b>	<b><u>Aquileia</u></b>	<b>**</b>
<b>?</b>	<b><u>Africa</u></b>	<b>**</b>
<b>?</b>	<b><u>Sicilia</u></b>	<b>**</b>
<b>?</b>	<b><u>Thessalonice</u></b>	<b>**</b>
<b>?</b>	<b><u>Pamphylie</u></b>	<b>**</b>
<b>?</b>	<b>Salona</b>	<b>**</b>
<b>?</b>	<b>Galliae</b>	<b>**</b>

Key:

plain text, e.g., Nicomedia : XXXV.1-48 a

bold text, e.g., **Nicomedia** : XXXV A i

bold italic text, e.g., ***Nicomedia*** : XXXV A ii

bold italic underlined text, e.g., ***Nicomedia*** : XXXV A iii

italic text, e.g., *Nicomedia* : XXXV A iv

\*\* = lost number.