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The Medieval Nile:
Route, navigation and landscape in Islamic Egypt

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5. The placement of ports.

This thesis has now considered two aspects of the riverscape of Egypt in the medieval period. Section 3 offered an interpretation of the routes and chronologies of the major waterways, seeking to locate those described by medieval authors in today's landscape. Section 4 sought to build an understanding of the navigational conditions encountered by people journeying on those waterways, their responses to those conditions, and the interface between the cycles of the Nile and the sailing seasons of the adjacent seas. This final section shifts the viewpoint away from the experience of the navigator. Instead it looks at the siting of a number of Egypt's major river and sea ports (see Figure 5.1). By considering their place – in the sense both of physical location and rôle – it seeks to develop an understanding of the extent to which their placement was determined by the environmental and navigational factors already described, and the extent to which other factors – social, political, economic – were at play.

The section is subdivided into four parts. The first situates the ports serving al-Fusṭāṭ/Cairo at the pivotal point of the Nile network. The second looks at the ports of the eastern Nile Delta – al-Faramā, Tinnīs, and Dumyāṭ. The third turns to the western Delta and the ports of Alexandria and Rashīd. The final section considers the ports of the Red Sea – al-Qulzum, 'Aydhāb and al-Quṣayr – and the Nile ports that served them.

5.1 The ports of al-Fusṭāṭ/Cairo

While the Roman administrative capital of Egypt had been Alexandria, the Islamic provincial government was established at the new settlement of al-Fusṭāṭ on the edge of the Roman fort of Babylon, today's Old Cairo. Ibn 'Abd al-Ḥakam famously claims that the Caliph 'Umar rejected Alexandria as Egyptian capital because it would be separated from the imperial capital, al-Madīnah, by water (*Futūḥ*: 130-1). There are other reasons. Alexandria was the urban expression of the Melkite Christian, Hellenistic and Mediterranean-oriented *ancien regime,* of which the new Muslim-ruled Egypt was not part. Moreover, the Muslims at first had no naval power, leaving the entire north coast vulnerable to Byzantine attack – indeed the Byzantines briefly retook Alexandria in 645 (Butler 1978: 469).

Like Babylon before it, al-Fusṭāṭ moreover occupied a strategic point on the river network. No vessel could pass between Upper and Lower Egypt, or along the Red Sea canal, without coming under the scrutiny of Egypt's political, military and fiscal authorities (see Figure 5.1 and Figure 5.2).

This natural topographic advantage was augmented by the maintenance of a floating pontoon bridge running between al-Fusṭāṭ and the island of al-Rawḍah, and thence to Giza on the west bank. Such a structure had been a feature also of the Roman riverscape: the Diocletianic fort of Babylon had controlled access to both the bridge and the Red Sea canal (Kubiak 1987: 117-8, 175). The bridge remained a feature of al-Fusṭāṭ/Cairo for most of the medieval period (al-Kindī, *Wulāt*: 192; al-Mas'ūdī, *Murūj*: 2.71; al-Quḍā'ī, in al-Qalqashandī, *Ṣubḥ*: 3.335; al-Maqrizi, *Khiṭaṭ*: 1.163) (Sayyid 1998: 75-6). Indeed, a similar pontoon bridge system is depicted in the *Description de l'Égypte* (Jomard 1809-28: État Moderne 1, pl. 16, 17.1) (see Figure 5.3), although not by Piri Reis or Harant three centuries earlier. This controlling feature appears to have been relaxed for a time in the Fatimid period. It was described in the tenth century by Nāṣir i Khusraw as running only from al-Fusṭāṭ to the island. In any case, the onward bridge to Giza was re-established under the Ayyubid al-Malik al-Ṣāliḥ, who also fortified the island (McKenzie 1992: 71-2).

The bridge created a point on the network by which the state authorities could regulate and tax river traffic while also projecting that control to river users in a monumental and navigationally intervening form. From the eighth century onward, those rounding the bend from upriver would have encountered the bridge, the monumental nilometer at the southern tip of al-Rawḍah (built 714/5), and the great mosque of 'Amr Ibn al-'Ās with its Umayyad minarets, an ensemble embodying Islamic rule over the Nile, its traffic and its cycles. Backing up these symbols was a military and naval force based on the island itself (Kubiak 1987: 104-6)

That the bridge also divided the port into zones of usage according to the place of origin of arriving vessels – Upper Egyptian vessels mooring above the bridge, Delta vessels below it – has been suggested by Kubiak (1987: 117-8). The very different nomenclature for boats in Upper Egypt compared to those in Lower Egypt indicated by the *Description de l'Égypte* table in Table 4.2 also suggests just such a division in the early 19th century.

The material harbour infrastructure of al-Fusṭāṭ, if later depictions of the later ports of Cairo are anything to go by, probably comprised little more than the riverbank, with wooden jetty structures facilitating the transfer of goods and people onto and off boats (see Figure 5.4 and Figure 5.5), this being a response to the huge seasonal variation in water level and river breadth. Boats were simply moored along the river-bank, as far north as the mouth of the Cairo Canal (Goitein 1967: 1.297).

Changes in the location of the main harbour serving the capital were driven partly by the gradual northward migration of the administrative centre – to al-'Askar under the Abbasids, to al-Qaṭā'ī under the Tulunids, and finally to Cairo under the Fatimids (see

Figure 5.2). With the founding of Cairo, a new port for the city was created at al-Maqs, between the east bank and the Cairo canal (see Figure 5.2). Its very name – al-Quḍā'ī says it derives from al-Maks, meaning customs duty (Sayyid 1998: 143n.) – announced the fiscal rôle of the port at the centre of an Islamic empire. Al-Fusṭāṭ continued to function as a suburb and port, however, and the two may have served Upper and Lower Egypt respectively (Gayraud *et al.* 1986, 1995; Gayraud *et al.* 1987; Gayraud and Peixoto 1993; Goitein 1967: 1.276, 278; Scanlon 1898, 1965, 1966, 1967, 1974, 1976; Scanon 1981). However, al-Maqs became increasingly unusable as the east bank of the river prograded westward during the 12-13th centuries, and again in the 14th century (Hassan 1997: 61; Said 1993: 66-8)(see Figure 5.2).

The ultimate Mamluk solution was the creation of a new harbour for Cairo, at Būlāq in the mid 13th century (Hanna 1983: 1-4) (see Figure 5.2, Figure 5.4 and Figure 5.5). The harbour was established under al-Ḍẖāhir Baybars, and should be seen in the context of his major re-excavation of the Alexandria canal, in that it served the growing trade between Mamluk Egypt and the Mediterranean. The development of Būlāq was further encouraged by al-Nāṣir Muḥammad ibn Qalāwūn – also a patron of a re-excavation of the Alexandria canal – who created the al-Nāṣirī canal between Cairo and Būlāq (see Figure 5.2), in part to drain the area and promote urban development there.

The progradation of the riverbank at al-Fusṭāṭ means that the areas of the medieval harbour are now under the fabric of the modern city: as a result, they have not been investigated archaeologically, nor have the harbours of al-Maks and Būlāq.

The floating bridge and historic harbours of al-Fusṭāṭ/Cairo represent in part the introduction of the controlling hand of the state into the construction of the waterscape attempted in this thesis. Navigating individuals were constrained not only by the spatial distribution of waterways and the navigational conditions and cycles considered previously, but also by state authority. The Islamic-era authorities were not creating an entirely new situation. Indeed their choices reflect what Dodgesohn (1998: 105-61) caracterises as landscape 'inertia', in that they continued systems and patterns of control, both in behaviour and the built environment, established in an earlier time.

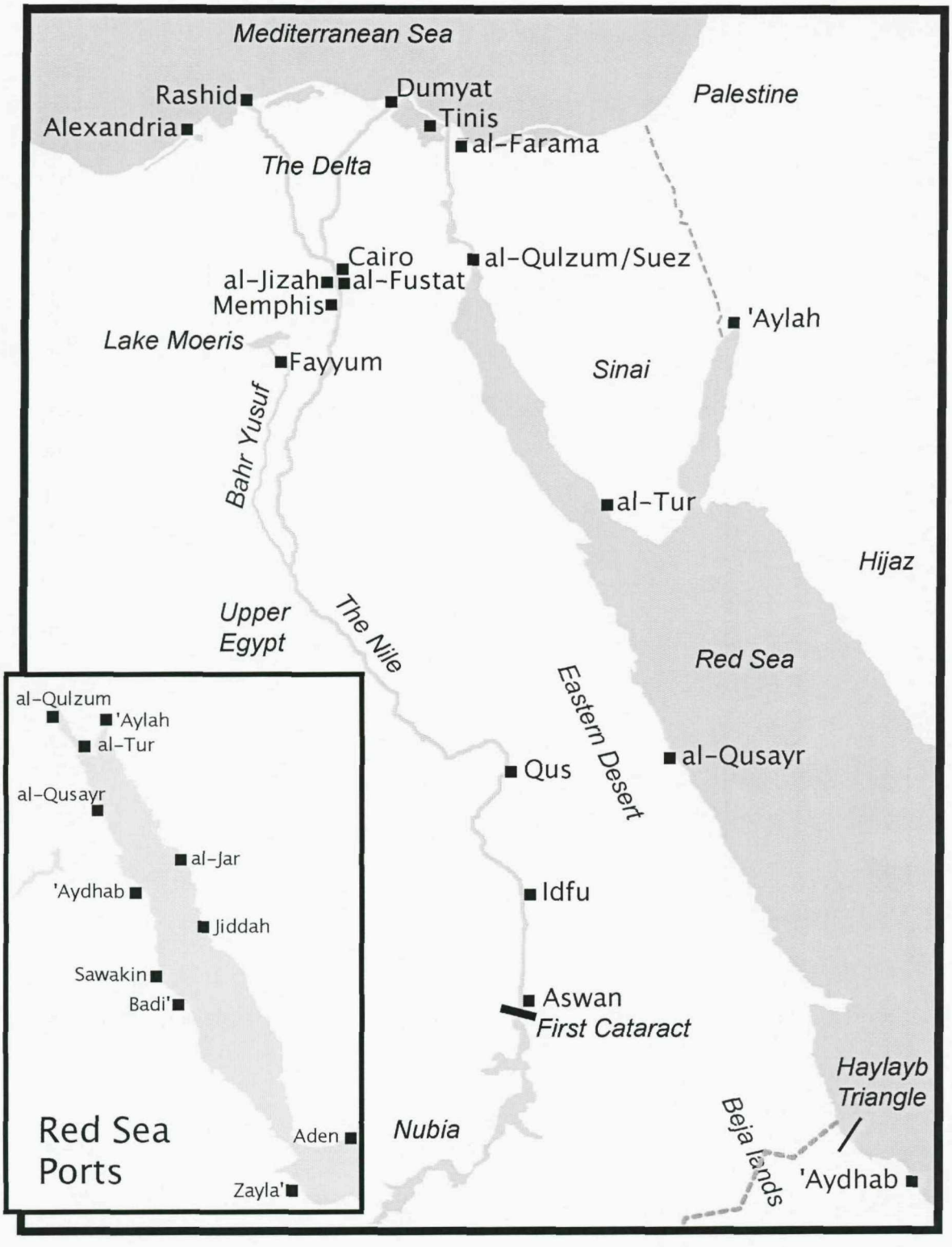

Figure 5.1: General map of the medieval ports of Egypt and the Red Sea, showing sites discussed in the text.

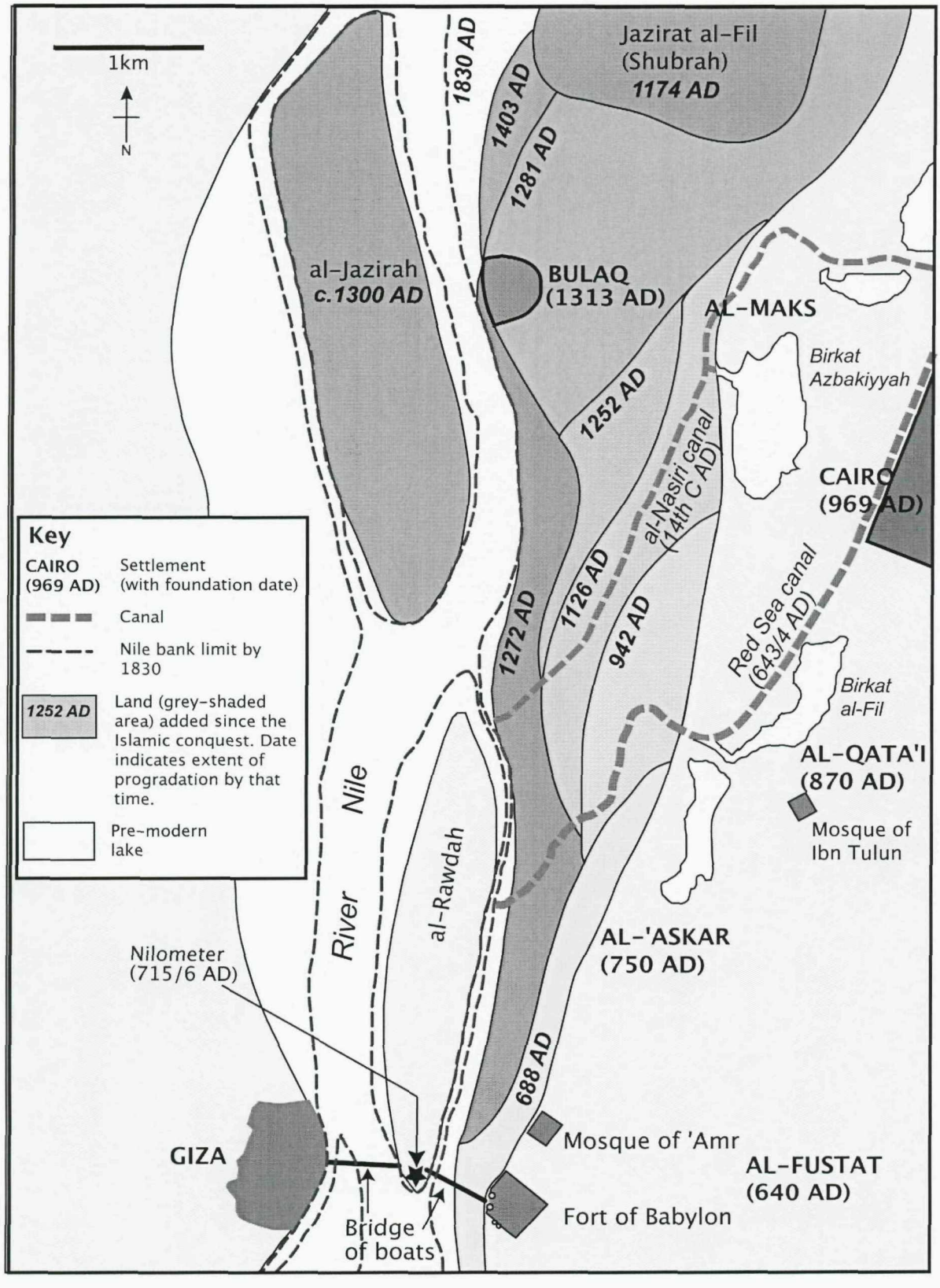

Figure 5.2: The al-Fustat/Cairo area showing the locations of the major settlements and the progradation of the river since the Islamic conquest. After Hassan (1997: 61), Said (1993: 66-8) and Abu-Lughod (1971: 8).

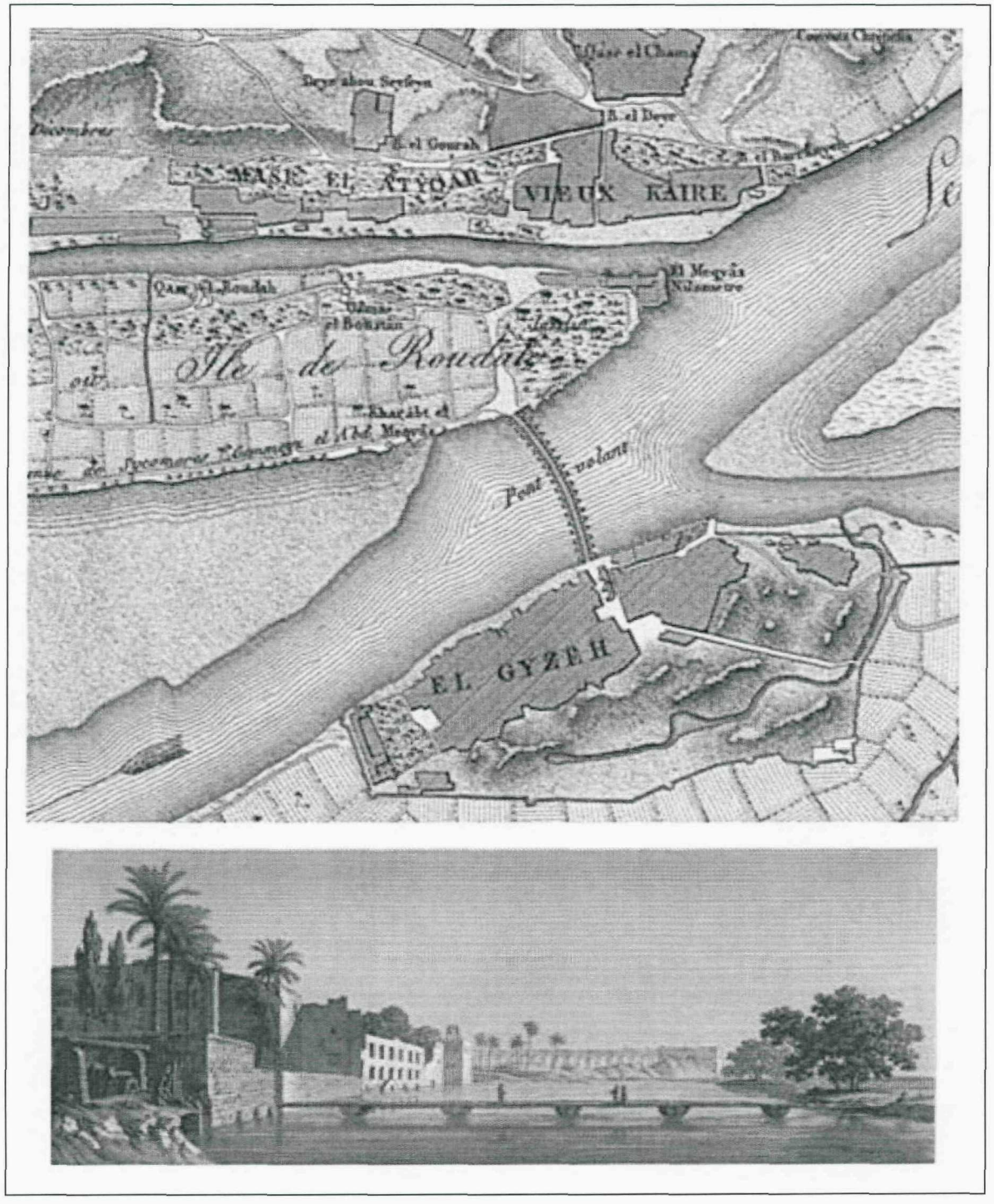

Figure 5.3: The 19th century pontoon bridge at Cairo, according to the *Description de l'Égypte*(État Moderne 1, pl. 15, 17): Plan of the bridge between al-Rawḍah island and Giza (above); view of the bridge linking Cairo to the island (below). Its medieval equivalent must have formed a barrier between the river traffic of Upper and Lower Egypt.

Figure 5.4: The harbour of Bulāq in the 19th century, according to W. Gentz. The image suggests the lack of harbour infrastructure associated with Nile port activity.

Figure 5.5: View of the waterfront at Bulāq in the early 19th century, according to the Description de l'Égypte (Jomard 1809-28: État Moderne 1 pl. 25).

5.2 Western Delta connections

Alexandria

Long-distance mercantile trade through the western Delta was dominated by the port of Alexandria. As it had been in the Helenistic and Roman periods, the city remained Egypt's Mediterranean harbour *par excellence*. Ibn Baṭūṭah says in the 14th century that :

> "It has a magnificent harbour [*marsā*]. I have not seen the like among the harbours of the world except the ports of Kūlum and Qālīqūṭ in the Indian lands, the harbour of the unbelievers at Sūdāq, in the Turkish lands, and that of Zaytūn in China." (*Riḥlah*: 1.28)

Alexandria's physical advantages were unarguable. Egypt's coast otherwise comprised an unrelenting lea shore with few sheltered harbours. The natural Nile mouths were treacherous, leaving the few shallow inlets into coastal lagoons the only other available refuges. Alexandria, in contrast, provided a natural, sheltered deepwater harbour, with vessels able to take shelter in the lee of the Pharos/Ras al-Ṭīn peninsula (see Figure 5.6). The Ptolemaic Pharos persisted as a navigational landmark on an otherwise flat coastline until an earthquake destroyed it some time between 1326 and 1349 (Ibn Baṭūṭah, *Riḥlah*: 1.27, 29-30).

Alexandria's great disadvantage – more so in the medieval period than in antiquity – was its dislocation relative to the Nile. Without human hydroengineering, it was remote from the waterway network. The dwindling of the Canopic branch left the Rashīd branch the city's closest natural Nile distributary. And while Strabo (*Geographica*: 17.1.7) had described Alexandria's Mareotic Lake harbour as busier even than the sea harbour, no medieval author – with the apparent exception of a Suhrāb – even mentions a connection via that lake. It was clearly not a major medievial waterway.

While the fall of Alexandria in 642 represented a turning point in the city's political status, it did not necessarily precipitate an immediate decline in the fortunes of city as a port. Some authors have characterised the period between the Islamic and Napoleonic invasions of Egypt as one of neglect and linear decline (Forster 2004: 69-73; Fraser 1991: 89-92), but this is not supported by the historical and archaeological data. Indeed, the very volume of words dedicated to Alexandria by medieval authors reflects the fact that it remained an important city. Alexandria was no longer the provincial capital of Egypt, but it retained a governor, a *qādī* (judge), and, until the Fatimid period at least, a great deal of political autonomy (Abdel Hamid 2000: 123; Haas 1997: 345; Sjipesteijn 2004: 119-20). It was also designated a *thughr* or frontier port, and retained a large garrison (Ibn 'Abd al-Ḥakam, *Futūḥ*: 131-2, 192; al-Maqrīzī, *Khiṭaṭ*: 1.74, 451-2). Moreover, the Umayyad

Caliph Mu'āwiyah (661-80) used Alexandria and its shipwrights to build up the Muslim navy (Haas 1997: 346).

Alexandria's population did fall in the medieval period from the estimated 200,000 of antiquity (Haas 1997: 340)[1]. Sources from the 13th and 14th centuries put it at 50,000-60,000 (Empreur 2002: 71). The walled area also shrank: the ancient walls had surrounded 1,000 Ha, the ninth century walls just 300 Ha (Haas 1997: 339; see Figure 5.6 in this thesis). However, Hass (1997: 346) and Hodges & Whitehouse (1983: 130-57) have argued that the decline came about not with the conquest, but with the shift of the Islamic Caliphate to Iraq under the Abbasids, and the re-orientation of trade to the east.

That situation began to change with the establishment of the Tulunid dynasty as an autonomous power centre in Egypt in 868 (Salem 2000: 112). Apart from building new city walls, Ibn Tulūn also had the Alexandria canal re-excavated in 259 AH (872/3). Al-Maqrīzī claims that, for the previous quarter-century, the city had been cut off from the Nile and dependent entirely on wells for drinking water (*Khiṭaṭ*: 1.463).

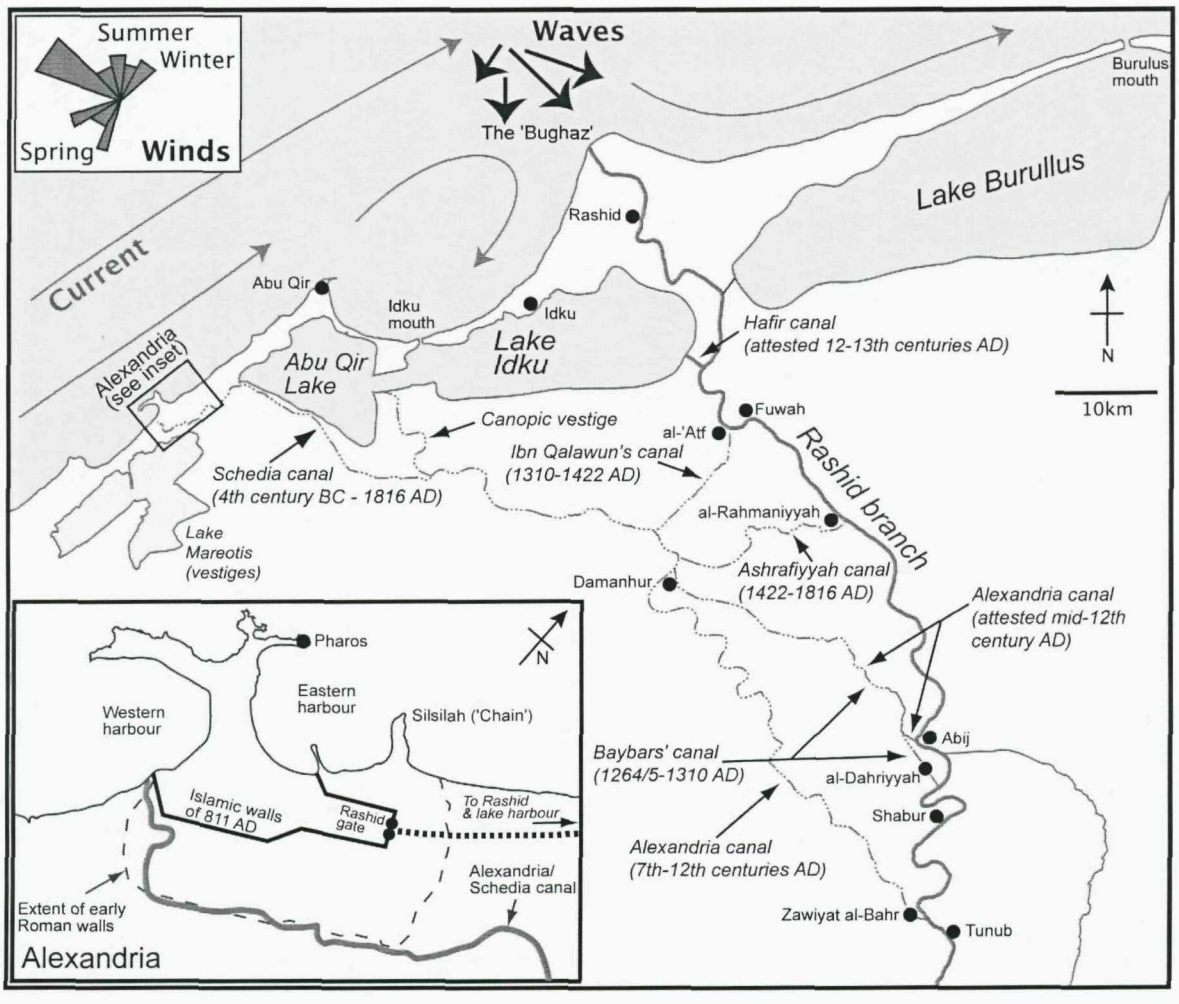

Figure 5.6: Medieval waterway connections to Alexandria.

[1] Ibn 'Abd al-Ḥakam put the population at the conquest at 600,000 Greeks and 40,000 Jews (*Futūḥ*: 81-2): he probably exaggerates.

Alexandria's resurgence continued with the establishment of the Fatimid dynasty in Egypt and the foundation of Cairo in 969 as its capital. From there the Fatimids sought to develop commerce with east and west (El Abbady 2000: 136; Empreur 2002: 72; Walker 2002: 40-1), establishing Alexandria as the premier Mediterranean port of Egypt (Udovitch 1977: 148, 158). Al-Maqrīzī (*Khiṭaṭ*: 1.463) reports that during this time the Caliph al-Ḥākim (996-1021) had the canal re-excavated at a cost of 15,000 dinars.

State investment in Alexandria continued under the Ayyubids, when Ṣalāḥ al-Dīn augmented the city's defenses and navy. The reason for that investment in defence is indicated by the fiscal accounts of Egypt of the year 585 AH (1189-90). During that year Alexandria yielded revenues of 800,138 dinars – two thirds of the 1.2mn-dinar revenues raised from the entire Nile Delta (*Khiṭaṭ*: 1.233).

By the Mamluk era, Alexandria was again a major port. The Alexandrian resident al-Nuwayrī (*Nihāyat)* gives a description not only of the markets of the city, but also the administrative structures – including the customs house – by which trade through the city was regulated and taxed.

The subsequent growth in trade through Alexandria in the Mamluk era is reflected in the substantial investments made in maintaining and optimising the function of the Alexandria canal, especially in the 13th and 14th centuries. The major excavations under al-Ḍhāhir Baybars (1260-77), al-Naṣir Muḥammad al-Qalawūn (1294-5, 1299-1309, and 1310-40) and al-Ashraf Barsbāy (1422-38) – including the radical changes in course discussed in Section 3 – apparently succeeded, briefly, in keeping the canal open year-round (al-Maqrīzī, *Khiṭaṭ*: 1.463-5).

When the city was attacked in 1365 by Pierre de Lusignan, King of Cyprus, some detail of the nature of greatly expanded trade through the city is suggest by al-Iskandarī's description of the city during this episode. It had governmental buildings, an arsenal and forts. Attacked were several markets and shop areas, including those for slaves, wood and perfume, candles, textiles, and funduqs for Catalonian, Genoese and Marseilles merchants (*Ilmām*: 4.2.1275r). There were, by that time, some 3,000 European traders living in the city (Curatola 2004: 188).

The dwindling of the Canopic branch noted in Section 3 demanded a concerted human response if Alexandria's harbour was to continue to serve river traffic. Vessels could continue to sail between the city and the Nile if they ventured by sea via the Rashīd mouth. However, the mouth was treacherous (see Section 4), and those bound for Alexandria had moreover often to beat against contrary currents and winds to pass the headland of Abū Qīr

– all, often enough, with a dangerous onshore breeze. Those arriving at the *bughāz* from Alexandria might find themselves shut out from the river for days, unless they chanced on calm or a southerly wind. Piracy was at times yet another deterrent for those considering the sea route (Goitein 1967: 1.327-32; *Devise*: 245).

The sea route between the Rashid mouth and Alexandria was nevertheless utilised, despite the dangers. Indeed, before the creation of the al-Ḥāfir canal, the sea route was the *only* means of reaching Alexandria by boat outside the Nile flood season. Larger *jarms* – the flat-bottomed barges noted by so many medieval visitors (see Section 4) – were employed for the task of crossing the *bughāz* and going by sea, with transhipment onto these vessels taking place in Rashīd itself.

For those unwilling to risk their lives or merchandise on the sea route, a commonly-used alternative was to travel by land between Alexandria and the Rashīd branch at Rashīd, using pack animals to carry the merchandise. Sometimes, merchants hedged the risk: they sent some of their bulk goods by sea, thus enjoying cheaper transportation costs, and transported more valuable items by the more costly, but less risky, land route (For land transport costs see Sjipesteijn 2004: 124-7). Coppin (*Relation*: 162) relates that in the 16th century, merchants in Alexandria sending goods to Cairo:

> "...place some in boats called *Germes* to take them to Rouset [Rashīd] ... But it is only bulk items that one sends by this route, because one carries to Rouset those of much greater value on camels ... because, apart from the fact that the *Germes* are not covered [against the elements], the coast is quite dangerous because of the outflow of the Nile, making one fear to risk merchandise of a considerable value".

All other routes by water to Alexandria were dependent on the maintenance of artificial canals – whether the al-Ḥāfir canal and lakes Idkū and Abū Qīr, or the various manifestations of the Alexandria canal. Their creation, and maintenance, required the interest of the state and the effort of those individuals the authorities coerced or co-opted into the physical task of excavation. The al-Ḥāfir canal can be seen as a straightforward – and compared to the Alexandria canal a relatively low cost – navigational canal that was simply intended to take advantage of the natural topography of the lakes to bring Alexandria navigationally within reach of the river network, and that with the excavation of a mere 4km or so of canal (see Figure 5.6). Compared to the multifaceted reasons, discussed next, for the maintenance of the Alexandria canal, the al-Ḥāfir canal-plus-lakes route was maintained as a navigational exigency, enabling unseaworthy vessels to reach Alexandria – and all to avoid the *bughāz*.

The excavation of the Alexandria canal was, by contrast, not simply a question of Egypt's ruler meeting a navigational need. Instead, the navigational interests of sailors and merchants were intertwined with other prerogatives and interests. Alexandria needed drinking water, and for this only a canal from the Nile would serve: hence the early medieval attempts to keep the route comprising the erstwhile Canopic branch and Schedia canals open. Even if the canal was only seasonal, it at least enabled the city's extensive cisterns to be replenished. Moreover, the Alexandria canal also met a number of revenue-raising objectives. A passage from al-Maqrīzī reflects the potential benefits taken into account by the Mamluk regime considering a proposed re-exacavation of the canal which were advanced to – and ultimately accepted by – Ibn Qalawūn in the 14th century. Al-Maqrīzī reports that the governor of Alexandria approached Ibn Qalawūn and with a proposal to re-excavate the canal. The arguments he advances were that the work would improve the transport of food and goods to and from Alexandria; it would increase customs revenues from trade through Alexandria; it would increase *kharāj* revenues by extending irrigation; and it would enable new villages to be built along its course (al-Maqrīzī, *Khiṭaṭ*: 1.463-5). Hence the canal met several objectives of the ruling élite, among which maintenance of a navigable waterway was one.

Rashīd

The perilous conditions at the mouth of the Rashīd branch were the principal reason that the city of Rashīd remained subordinate to Alexandria for as long as there were effective means of connecting the latter to the Nile network.

The name Rashīd comes about soon after the Islamic conquest. It is first mentioned historically in a tradition carried by Ibn 'Abd al-Ḥakam (*Futūḥ*: 6), and dated before 700 (Kamal 1930: 3.1.482r). It also appears in a papyrus letter written in 735 (Sjipesteijn 2004: 135-6), and is noted by al-Kindī as the site of a revolt in 750 against the last Umayyad Caliph, Marwān II (*Wulāt*: 96). According to Ibn Khurdādhbah (*Masālik*: 82), it lent its name to the *kūrah* of "Ikhnā and Rashīd": later al-Quḍā'ī (*al-Mukhtar*, in Yāqūt, *Buldān*: 1.166) lists it as a *kūrah* in its own right (*Mamālik*: 3.3.730v), a status it kept until the administrative reforms of the Fatimid era (Atiya 1995: 438).

However, Rashid does not emerge from the historical texts as a town or port of great significance. In the ninth and tenth centuries, it is overlooked by the historians al-Baladhūrī and al-Ṭabarī, by the geographers al-Khawarizmī, al-Farghānī, Ibn Rustah, Qudāmah, Suhrāb, Iṣṭakhrī, Ibn al-Kindī, al-Muhallabī, and by the anonymous *Kitāb Ṣūrat al-Arḍ* and *Ḥudūd al-'Ālam*. Its location on the coast is only cursorily noted by Ibn Ḥawqal (*Ṣūrat*: 87)

and al-Mas'ūdī (*Murūj*: 1.265). Al-Muqaddasī (*Aḥsan*: 55, 194) says that the city 'belongs' to the fort of Alexandria.

In the Fatimid period, Ibn Zūlāq's geography simply locates Rashīd as representing the opposite extreme of the Egyptian Nile to Aswan (*Faḍā'il*: 3.2.685v). Its location is noted in the astronomical geography of Ibn Yūnis (*Zidj*: 3.3.707r), the descriptive geography of Abū-l-Ṣalt (in Yāqut, *Buldān*: 4.548), and by Ibn Mas'ūd (*Tārīkh*: 10-11) and Benjamin of Tudela (*Massa'ot*: 3.4.879r). It is omitted by al-Birūnī, however, and escaped the notice of Nasir-i-Khusraw and Ibn Jubayr in their visits to Egypt, as well as the astronomical geography of Gerard of Cremone (*Theorica Planetarum*). The early Abbasid *Kitāb al-Istibṣar* (908r) describes Rashīd as a "large city", but attributes no port function to it. Al-Idrīsī describes Rashīd as a populous agricultural town with a fishing industry – but again does not describe it as a port (*Nuzhat*: 3.343).

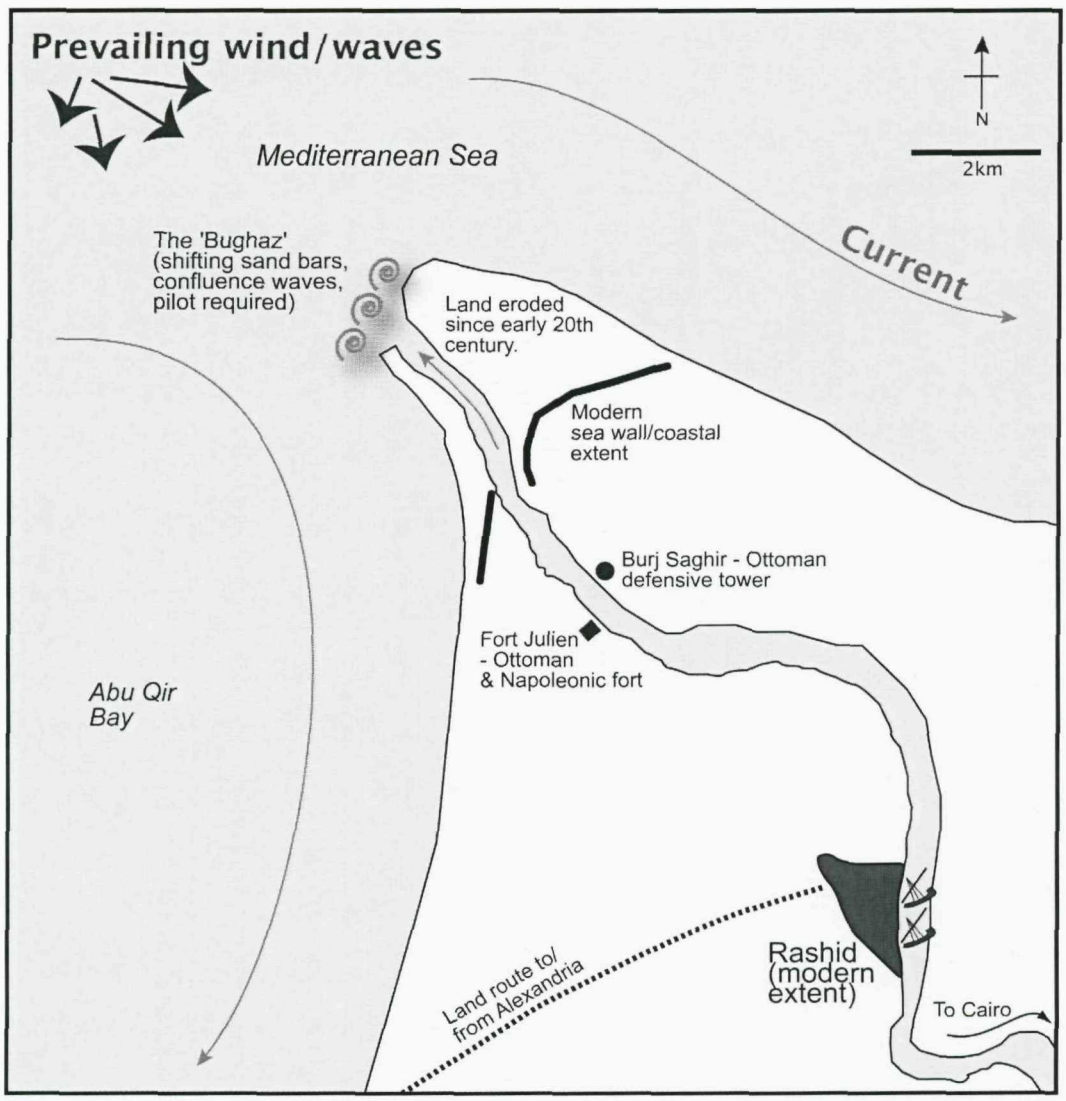

Figure 5.7: The port of Rashid, showing its problematic navigational link to the Mediterranean via the Rashid mouth, or Bughaz. The Rashid promontory has eroded significantly since the building of Nile dams at Aswan in the 20th century (Frihy and Lawrence 2004).

During the 13th and 14th centuries, while the Mamluk authorities were taking great pains to maintain the Alexandria canal, historical mention of Rashīd diminishes greatly. In the 13th century, three European texts – *La Devision de la Terre de Oultremer*, *De Situ Civitatum Egypti* and the *Peregrinatio* of Thetmar– fail to register the town's existence, despite discussing the Mediterranean coastal ports of Egypt. Of the Crusader literature surrounding the 1218 siege of Damietta, Oliver of Padeborn (*Historia*: 3.4.938v) and Nicholas, Patriarch of Alexandria (*Letter*: 3.4.938v), identify the Rashīd *branch* as a potential point of entry for an invasion force. The former, however, says the city was 'in ruins'. Around the same time, Yāqūt describes Rashīd as "a small town [*bulaydah*] on the shore of the sea and Nile, close to Alexandria." (*Buldān*: 781-2). For the geographer al-Maraqūshī, the only Egyptian coastal towns noted are Alexandria and Dumyāṭ (*Jāmi'*: 3.5.1004r). Meanwhile, Vincent de Beauvais (*Speculum*: 1023v) omits Rashīd from his 'royal' cities of Egypt (*Speculum*: 1023v). Later in the century, Ibn Sa'īd locates Rashīd, but in his discussion of the town he is interested only in the al-Ḥāfir canal bypassing it to the west, and the fisheries of Lake Burullus to its east (*Untitled*: 4.1.1087r-8v). For al-'Abdārī, like many others, Rashīd is simply where the Nile enters the sea (*Riḥlah*: 4.1.1099). Al-Qazwīnī omits it entirely. The Crusader *Devise des Chemins de Babiloine* (245) notes the Rashīd branch as a potential invasion route, but sees the 'village' of Rashīd simply as a potential target for lightning piratical raids.

In the fourteenth century, al-Shirāzī (*Tuḥfah*: 4.1.1141v), Marinus Sanutus (*Liber Secretorum*: 1.6.25-6), and Abū al-Fidā (*Taqwīm*: 117) say simply that Rashīd was where one of the Nile branches debouched, the latter calling it a "small town", and adding that it's nearby mouth was called "al-Armasiyyah, and boats entering from the sea fear it.". Al-Dimashqī (*Nukhbat*: 231) says that Rashīd town had "...become overwhelmed by sand, which had covered it repeatedly, and its people had moved to Fuwah." Rashīd is omitted from Boccace's description of Egypt (*Descriptio*: 4.2.1282v), and the commercial directory of Pegolotti, which lists the ports of Egypt in commerce with Italy (*Pratica*: 77). Ibn Batūtah travels via Fuwah, but does not mention Rashīd (*Tuḥfat*: 1.48-56).

Rashīd fares no better in the major Egyptian works of the 14th-15th centuries. Ibn Duqmaq (*Intiṣār:* 113-4) notes that is its "population was few, and generally fishermen or wildfowlers." He makes no mention of it as a port, but rather states its defensive function as a "*thughr*", with a lighthouse built on a hill by al-Ḍhāhir Baybars for spotting 'Frankish' ships, and a fortified tower built by Salāḥ al-Dīn on the riverside. Al-Qalqashandī notes the town as a "village", and elsewhere a Nile-mouth *thughr*, and relates Abūqir and Burullus with reference to it (*Ṣubḥ*: 3.236, 292, 307, 409, 2.184, 380, 14.52, 65). Al-Maqrīzī,

meanwhile, dedicates numerous chapters to cities and small towns around Egypt, but not to Rashīd. He simply notes it as marking the limit of the Nile (*Khiṭaṭ*: 1.38, 61, 146, 492) or as a *thughr* (*Khiṭaṭ*: 1.74, 294, 349). He also provides a reason for his indifference: the town yielded revenues of just 1,000 dinars in 585 AH (1189-90), compared to 800,138 dinars for Alexandria, and 1.2mn dinars for the entire Delta (*Khiṭaṭ*: 1.233).

Rashīd is likewise omitted from the Italian portulan cartography of the period. While the Rashīd *branch* is often labelled as such (Vesconte, *Untitled*; Marinus Sanutus, see Appendix 1. Figure 23; Dalorto, *Planisphere;* Dulcert, *Planisphere;* Pizigani, see Appendix 1, Figure 29), the town itself is usually omitted.

Such a representation of Rashīd in the textual sources suggests that it was of much lesser significance than its apparently highly strategic location near one of the two main mouths of the Nile might otherwise suggest. It is only in the Ottoman period, outside the parameters of this study, that Rashīd develops into a significant town – perhaps an indicator of the state of the Alexandria canal during that time.

Although of minor importance as a commercial port, Rashīd did have an importance in the defence of the entrance to the Nile. Medieval authors refer to the town as a *thughr* (al-Sam'ānī, *Ansāb*: 3.4.877r; al-Harrānī, *Jāmi'*: 4.1.1126v). In the Mamluk period, the port is described as a *ribāṭ*, or garrison town (*Inṭiṣar*: 5.113-4). It was also one of the coastal cities that Ibn Mufraḥ says was walled by the Abbasid Caliph al-Mutawakkil (847-61) for fear of Byzantine attack (*Siyar*: 3.3.746v). The town was certainly walled in 919/20, when it was besieged by the rebel Abū-l-Qāsim 'Ubayd Allāh (Eutychius, *Naḍhm*: 3.1.567v). Meanwhile Marinus Sanutus believed that the entrance to the Rashīd mouth, like that at Dumyāṭ, was guarded with a chain (*Liber Secretorum*: 4.1.53).

The overwhelming reason for the relative insignificance of Rashīd compared to Alexandria is the navigational obstacle represented by the Rashīd mouth and discussed in Section 4.5. The passage between river and sea was a dangerous one, and hence the river mouth itself did not represent an easy and predictable haven for seagoing vessels. For that, Alexandria was the solution: communication with the river network, especially during intersecting peaks of the Nile and Mediterranean sailing seasons, could be made instead through the Alexandria canal.

Note should be made here of a further river port of western Delta commerce, whose importance arose from the establishment of Ibn Qalawūn's Alexandria canal with its offtake at al-'Aṭf. Fuwah, on the Rashīd branch, acquired new importance with the shift in the mouth of the canal: it became the stopping and taxation point for vessels entering and

leaving the canal, and indeed the control point for traffic passing also via the Rashīd mouth and the lakes (see Figure 5.6, Appendix 1, Figure 1). Ibn Qalawūn's cadastral survey gives Fuwah annual revenues of 16,000 dinars – largely through imposts on vessels passing through, compared with just 5,000 for Rashīd (al-Jī'ān, *Tuḥfah*: 669-70). Fuwah is also frequently marked on the same portulans of the period that omit Rashīd (for example Dalorto, *Planisphere*; Dulcert, *Planisphere*; Pizigani, see Appendix 1, Figure 29). Fuwah's importance appears to have persisted until some time in the late 17th century: Pococke, travelling in 1737, reports that European 'factors' had resided there until "fifty or sixty years ago", when the main trade route to Alexandria had switched from via the canal to via Rashīd (*Description*: 1.16).

5.3. The Eastern Delta ports

Section 3 of this thesis showed how the topography of the eastern Delta changed markedly in the early centuries of Islam: the Pelusiac branch of the Nile dwindled and became blocked; Lake Tinnīs expanded; and the Dumyāṭ branch became the largest distributary in the region. The biographies of the ports in the region reflect these fluvial changes – in part.

Al-Faramā

Al-Faramā served two purposes in Egypt's medieval commercial maritime traffic. It stood, for a time at least, at the mouth of the easternmost branch of the Nile Delta, through which maritime traffic with the eastern Mediterranean passed (see Figure 5.1, Figure 5.8 and Figure 5.9). It was also the northern port serving the Isthmus of Suez route, through which land traffic passed to and from al-Qulzum (see Figure 4.8). When in the ninth century the Nile distributary on which the city stood silted up, Tinnīs took its place as the pre-eminent seaport of the eastern Delta. The significance of the Isthmus crossing was diminished by the onset of Fatimid rule in Egypt, and the city was eventually abandoned in the 12th century following two devastating Crusader attacks.

When Spratt (1859: 4-5) visited Tall al-Faramā in the 19th century, he found the site topped by a "quadrangular fortress" built of burnt brick and mortar, with a north-facing door guarded by two towers, one of which was "almost perfect at the present time". He believed, wrongly, that the site was exclusively medieval in date, and that classical architectural elements had been imported from 'Pelusium', which he believed was elsewhere. Spratt attributed the fortress to al-Mutawakkil, following the historical sources. He identified two other mounds in a line to the east of Tall al-Faramā, called locally al-Makhzin (stores) and al-Kanā'is (churches). Whether these names reflect earlier usages is unknown. Spratt also found a "very few" coins with Arabic script on them and none earlier, and a glass stamp with an inscription hailing "Abd 'Allah".

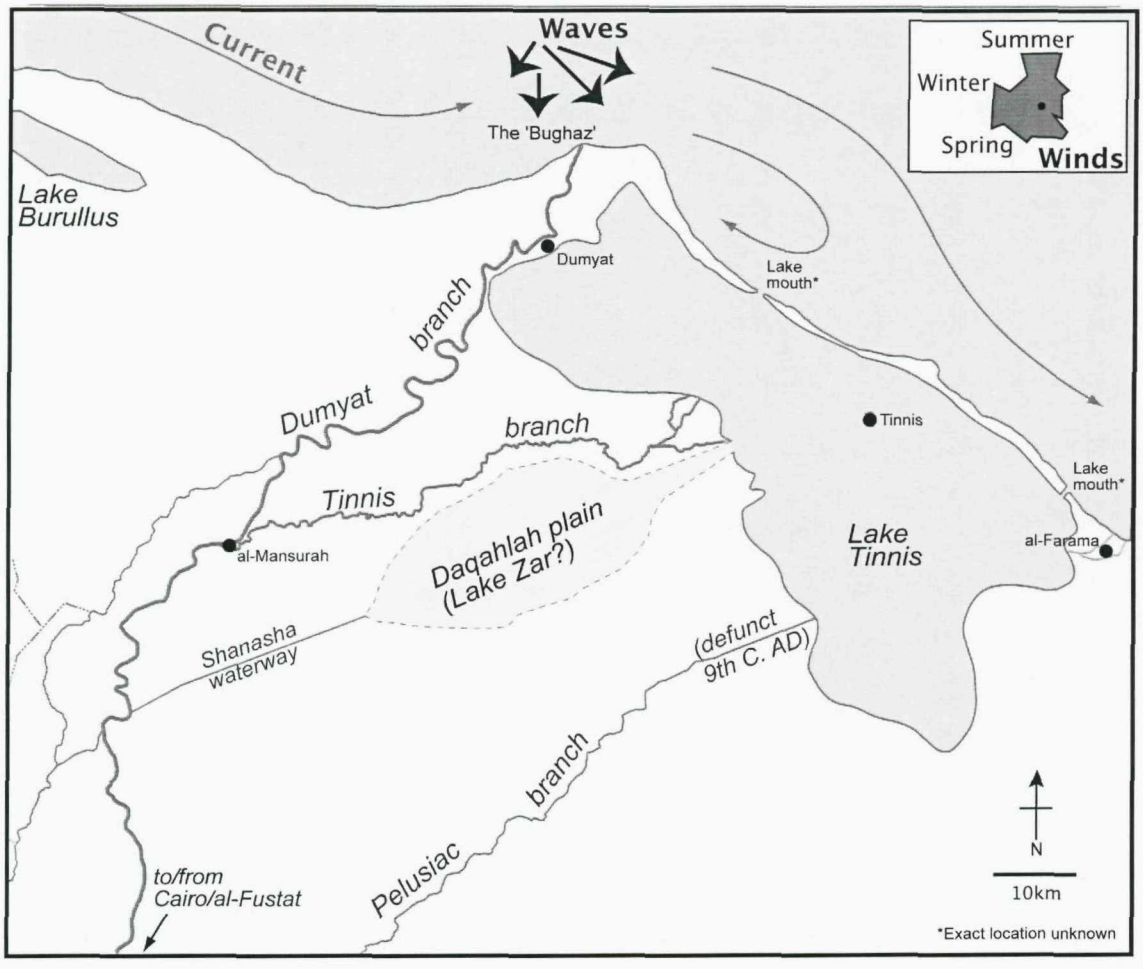

Figure 5.8: Medieval waterway connections to Dumyāṭ, Tinnīs and al-Faramā.

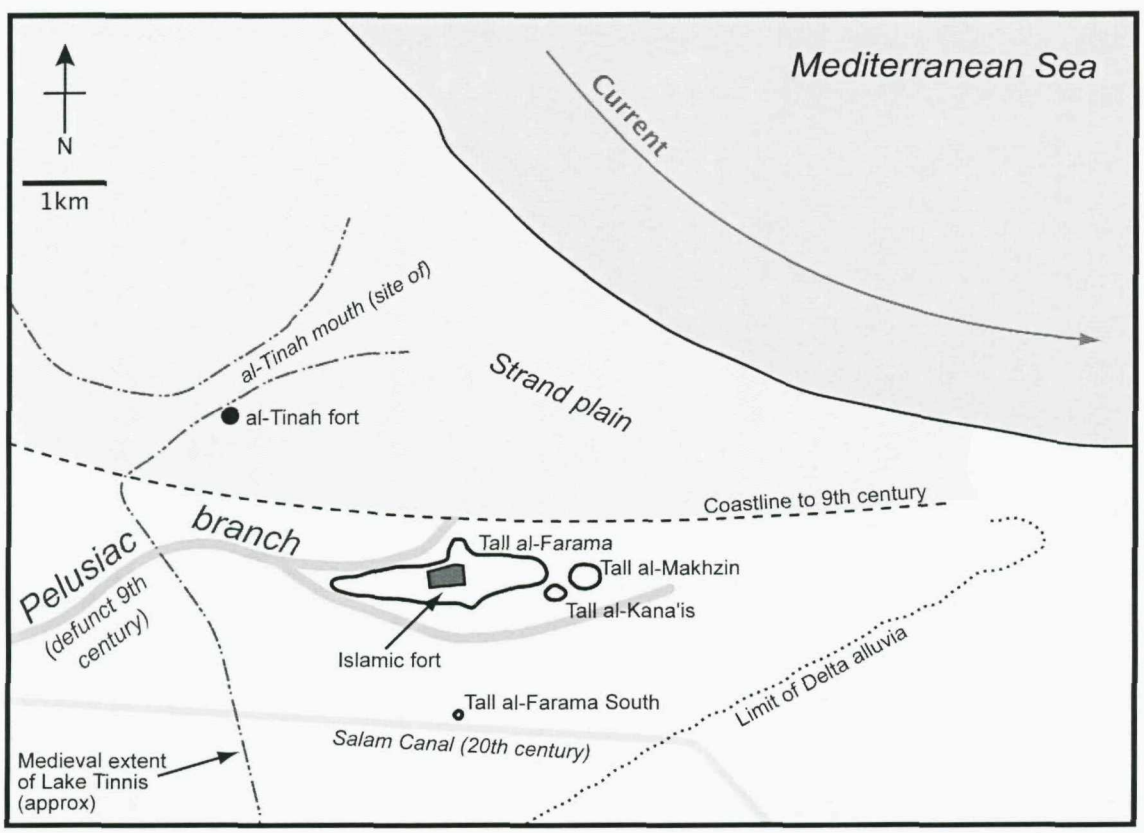

Figure 5.9: Tall al-Farama, site of ancient Pelusium and medieval al-Farama, after Snape and White (1996), Sneh and Weissbrod (1973), and Goodfriend and Stanley (1999).

Excavations in the 1990s confirmed that Tall al-Faramā is indeed ancient Pelusium, with the excavation of a theatre built in the 'high Imperial period' containing pottery mostly from the fifth century, and Gazan amphorae belonging to the fourth-seventh centuries (al-Taba'i *et al.* 2003: 271; Gawlikowski 2004; Jakubiak 2004). Excavations at the suburb of Tall al-Kanā'is revealed a second theatre/arena, with occupation indicated until the early seventh century (Jaretz *et al.* 1996: 127).

Islamic-era occupation was indicated at the southern part of the main tell from 11-12th centuries (Ballet 1992: Rapport B; Jaretz *et al.* 1996: 53), and a medieval chapel has been identified at Faramā West (El-Taher and Grossman 1997: 261; Grossman and Hafiz 1998). Of the smaller satellite tells, only Tell al-Zujāj and Tall al-Makhzan indicate Islamic-era occupation. Surface investigation at Tall al-Zujāj has yielded a modest medieval building, Nile silt wares, and ninth-tenth century Egyptian fine wares; Tall al-Makhzan indicates occupation in the Ummayad period, and "slightly later" (Bonnet et al. 2004; Jaretz *et al.* 1996: 53).

Pelusium had been important throughout the Ptolemaic, Roman and Byzantine eras, and is widely attested in historical, and epigraphic texts (Carrez-Maratray 1999: 41-273). The undated *Apospasmatia Geographica* (2.3.425r) says that its distributary was "the first mouth of the Nile for those coming from Asia", hinting at the traffic passing through the port.. The (c.) fourth century Peutinger map (Appendix 1, Figure 8) and the sixth century Madaba map (Beazley 1901: 208) depict it as a city of primary significance. As well as being a port, the city was also on the main road to Gaza and the Levant (Figueras 2000: 7). The city remained an important fortification at the time of the Arab conquest. It was the site of the first battle in Egypt between the Byzantine military and Muslim forces arriving from Palestine: the Muslims found a garrisoned town that withstood siege for a month (Ibn 'Abd al-Ḥakam, *Futūḥ*: 58-9; al-Balādhūrī, *Futūḥ*: 212; al-Kindī, *Wulāt*: 7-8) before suing for peace (al-Ṭabarī, *Tārīkh*: 1.5.2056; Ibn Khālawayh, in al-Maqrīzī, *Khiṭaṭ*: 1.575).

The historical data indicate a city of continued importance in the early centuries of Islam. The *Thronos Alexandrinos* (3.1.491v) lists the city, now al-Faramā, as an ecclesiastical metropolis. Al-Ṭabarī (*Tārīkh*: 3.1.132) says that the last Umayyad Caliph, Marwān II, was in the city in 750 when he learned that the pursuing Abbasids were preparing a seaborne attack from Palestine. In 239 AH (853-4), al-Mutawakkil fortified the city against Byzantine attack, along with Tinnīs and Dumyāṭ (al-Maqrīzī, *Khiṭaṭ*: 1.575). In the same century, al-Khawarizmī notes its location in his mathematical geography (*Ṣūrat*: 15-8); al-Farghānī (*Ḥarakah*: 36-7) names it among seven Lower Egyptian cities; and Ibn Khurdādhbah (*Masālik:* 81-3) identifies it as a *kūrah* capital.

Al-Faramā's fortifications were tested in the tenth century. Al-Maqrīzī reports Byzantine raids on the port in 343 AH (954/5) and 349 AH (960/1). He says that the city was a naval port, protecting against Byzantine and later Frankish attack (*Khiṭaṭ*: 1.575; 3.602).

The city remained a *kūrah* capital in the tenth century (Qudāmah, *Kharāj* :247-8; al-Muqaddisī, *Aḥsan*: 193-5), during which it was visited by the protagonists in the struggles for control over Egypt during the Tulunid and Ikhshidid periods (al-Maqrīzī, *Khiṭaṭ*: 2.100, 119-20). A century later, al-Miṣrī says it was a *thughr* (in al-Maqrīzī, *Khiṭaṭ* 1.74). As late as the mid 11th century, al-Bakrī describes al-Faramā as "a city on the coast of beauty and many good things" (*Mamālik*: 3.3.731r). However, it is absent from the *kūrah* lists of al-Musabbiḥī and al-Quḍā'ī, hinting at an incipient decline (Toussoun 1926-8: 8.1.4-13). Following the Fatimid abolition of the *kūrah* system under al-Mustanṣir Bi-llah (1036-1094), the city does not appear in lists of *a'māl* divisions that replaced it (Toussoun 1926-8: 8.1.41-4).

Al-Faramā's demise came about with the onset of the Crusades. The city was devastated in 1118 by the invading Baldwin I, King of Jerusalem, and a further major Crusader attack in October 1150 prompted the Fatimid vizier Shāwar to order the city's demolition (al-Maqrīzī, *Khiṭaṭ*: 1.575). The city fades from the historica record thereafter. It is already absent from the 12th century geographical works of al-Kharāqī, al-Zuhrī, al-Iskandarī and al-Makhzūmī. William of Tyre, writing of the 1169 Crusader attack on Dumyāṭ, describes the city as "now uninhabited" (*Historia Rerum*: 2.363). A century later, Ibn Sa'īd says it is "ruined" (*Untitled*: 4.1.1088r).

The historical sources offer no data on al-Faramā as a port before the early ninth century – that is, when the Pelusiac branch was still flowing. Later sources suggest two remaining economic functions for the city. The first was as a staging post on the land route between Egypt and Palestine (al-Ya'qūbī, *Buldān*: 330; Qudāmah, *Kharāj*: 219-20). The second was as the Mediterranean port serving the Isthmus of Suez crossing. Ninth century activity at al-Faramā is indicated in Ibn Khurdādhbah's discussion of the Jewish Rādhāniyyah traders, for whom the trans-Isthmus connection was a link in a global trading network:

> "[They] speak Arabic, Farsi, Roman, Frankish, Andalusian and Sicilian. They travel from the east to the west and from the west to the east by land and sea. From the west they bring male, female and boy slaves, brocade and the skins of beaver, wild ass and sable, and swords. They sail from the Frankish land on the western sea, disembarking at al-Faramā, and they carry their merchandise by [camel]back to al-Qulzum. Between the two is 25 *farsakhs*. Then they sail on the eastern sea from al-Qulzum to al-Jār and Jiddah, then they pass on to Sind,

> India and China. From China they bring musk, timber, camphor, cinnamon and such other things as come from those places. Then they return to al-Qulzum and transport it to al-Faramā. Then they sail on the western sea. They may take their merchandise to Constantinople, selling it to the Byzantines. They may go to the Frankish king, and sell it there. If they so wish, they disembark at Antakiyya and travel three days by land to al-Jābiyyah, then they said on the Euphrates to Baghdād. Then they sail on the Tigris to al-Ubulah, and from there to Oman, Sind, India and China, all that connected, one to the other." (*Masālik*: 153-4)

In the late tenth century, Ibn Zulāq describes al-Faramā, along with Tinnīs and Dumyāṭ, as an Egyptian "...portal[...] to the lands of Byzantium, the Frankish littoral, Cyprus, the length of the Levant coast and the ports [serving] Iraq" (*Faḍā'il*: 3.2.685r). His contemporary, Ibn al-Kindī, makes the connection with al-Qulzum explicit: he describes al-Faramā as "... the meeting place of the two seas ... the barrier between them is a journey of a night between al-Qulzum and al-Faramā." (in al-Maqrīzī, *Khiṭaṭ*: 1.578)

Al- Faramā also served as an interchange between the north-south Isthmus route and the land routes between Egypt and the Levant. Ibn Ḥawqal calls al-Faramā:

> "...an ordered (*ṣāliḥah*) city towards the Roman Sea. The traders return to it by land and sea, day and night, from al-Fusṭāṭ and the Levant, because it is a day's journey in the road" (*Ṣūrat*: 85-6).

Al-Muqaddasī describes the city as *majma' al-ṭuruq*: 'the gathering of the roads' (*Aḥsan*: 195).

Al-Faramā's continued existence following the loss of its Nile branch was thus thanks to its strategic location at the end of the Isthmus of Suez and as a staging post on the land route between Egypt and the Levant. With its Nile connection lost, drinking water came from rainwater, wells, or by boat from Tinnīs (al-Muhallabī, in al-Maqrīzī, *Khiṭaṭ*: 1.480, 575). The lake connection with Tinnīs is also noted in the *Kitab al-Istibṣār* (3.4.908r).

However, the trans-Isthmus trade that supported al-Faramā following the loss of its Nile branch was severely diminished by the establishment of independent rule in Egypt, first under the Tulunids, and in particular during the Fatimid period, at which time the state abandoned al-Qulzum, al-Faramā's sister port across the Isthmus, in favour of the route via 'Aydhab and the Nile valley (*see below*). When it was attacked twice in the 12th century, Egypt's rulers took the view that it was no longer worth defending, and its walls were demolished.

Tinnīs

Scholars have speculated why it was that a major industrial settlement such as Tinnīs was sited in such an apparenty inconvenient location (Gascoigne 2007: 163). From the perspective of its function as a port, the reason is less mysterious. On an island within Lake Tinnīs (see Figure 5.1, Figure 5.8, and Figure 5.9), the city was sheltered from the worst effects of the Mediterranean storms and wave fields, yet at the same time connected to the sea through the lake mouths, and also to the Nile network via the Tinnīs branch. Crucially, the route between sea and Nile network was considerably safer, and more predictable, than passing through the Dumyāṭ mouth. Indeed, in the fourth century, John Cassian regarded maritime trade as the primary function of Tinnīs (*Collationes*: 409).

Already in the relative calm of the lake, the built-up island itself must have provided ships with extra shelter from the prevailing north-northwesterly winds. That the habour would therefore be on the southern shore of the island is supported by the medieval map of Tinnīs in the Book of Curiosities (Appendix 1. Figure 19). The map has the harbour area beneath the city, in opposition to the Mediterranean, which is at the top. The map shows two channels piercing the city walls, one of which is marked as being gated. Candidates for these channels can be seen in modern satellite imagery of the city (see Figure 5.10). Geophysical investigations of the southernmost of these canals have revealed quay structures to the west of its mouth (Gascoigne 2005).

Tinnīs existed before the Islamic conquest. It was visited in the fourth century by John Cassian (*Collationes*: 11.1) and is marked, as Thennissos, on the Madaba Map (Appendix 1, Figure 9). By the start of the seventh century it was capital of an ecclesiastical diocese, and gave its name to a Nile distribuary (George of Cyprus, *Description*: 172). Its history may go back to the pharaonic and even Predynastic eras (Gascoigne 2005; Gascoigne forthcoming).

The fate of the city at the time of the conquest is not clear. Referring to the now lost *Tārīkh Dumyāt*, al-Maqrīzī (*Khiṭaṭ*: 1.480) relates that the city's Byzantine governor refused to sue for peace. As a result, when the Muslims took the city by force, its main church was converted into a mosque. However, an earlier tradition of Abū Tamīm al-Jayshānī from around 700 states that the city capitulated, and under the same terms as Babylon (al-Baladhūrī, *Futūḥ*: 216-7).

Following the conquest, Tinnīs became the periodic target of first Byzantine, and later Crusader attack. Al-Maqrīzī (*Khiṭaṭ*: 1.481, 2.50, 3.605) records a Byzantine naval raid on Tinnīs in 101 AH (719-20). Al-Ṭabarī (*Tārīkh*: 3.3.1478-9) describes a further, major Byzantine attack on the eastern Delta coast in 238 AH (852-3). The force, comprising 300

vessels each carrying 50-100 men, raided Dumyāṭ and nearby Shaṭā. The escaping invaders hampered pursuit by burning the sail stores at Dumyāṭ. On this occasion Tinnīs went unscathed – saved, it seems, by its location. The Byzantine ships reached 'Ushtūm Tinnīs, then entrance to Lake Tinnīs from the sea, but could go no further. There:

> "... the water would not float their ships, and they feared that they might ground. When the water would not carry their boats, they went to the 'Ushtūm, which is an anchorage less than four *farsakhs* from Tinnīs with walls and a iron gate whose construction had been ordered by al-Mu'taṣim [833-42]. They destroyed it generally, burning the *majānīq* and *'arrādāt* [war engines] in it, removing and carrying off the iron doors, and then heading off to their lands without anyone opposing them." (*Tārīkh*: 3.3.1478)

That raid prompted al-Mutawakkil a year later in 853-4, to "build a fort on the sea at Tinnīs" at the same time as Yāqūt, al-Maqrīzī and Ibn Duqmāq say he fortified Dumyāṭ and al-Faramā (*Buldān*: 2.603; *Khiṭaṭ*: 1.487; *Intiṣār*: 2.53). According to al-Tinnīsī, a native of the city probably writing some time in the 11th-12th centuries, the city then had nineteen gates and two defended harbours reached under a bridge and protected by iron-clad gates (*Anīs*: 36).

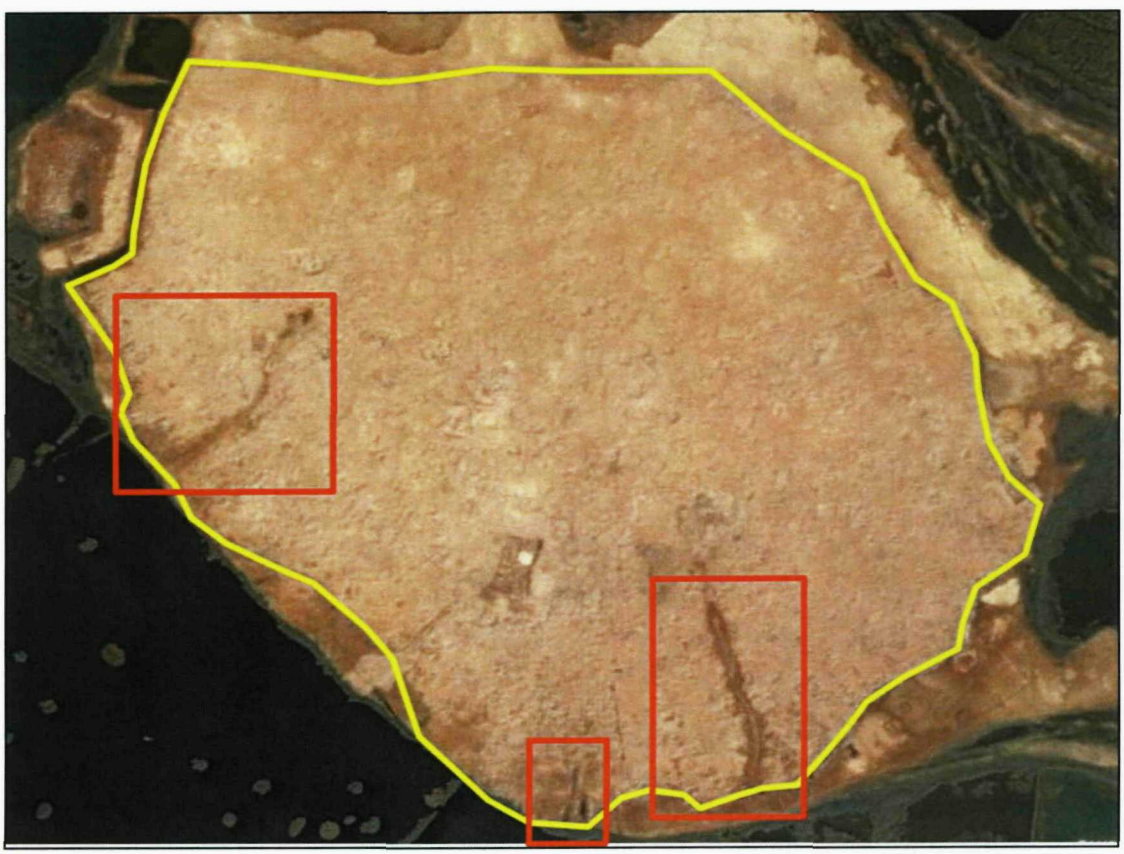

Figure 5.10: The site of Tinnīs, in Lake Manzalah (medieval Lake Tinnis). Candidates for the harbour channels suggested by the Book of Curioities map are indicated by red boxes. the city wall is traced in yellow. (Goolge Earth™).

There is no further historical record of Byzantine attack on Tinnīs. However, by the late ninth century, with the emergence of the Tulunids, the threat came also from Abbasid Baghdād. Al-Maqrīzī says that it was at Tinnīs that the Tulunid navy repulsed the Abbasid naval attack of 903-4, and where in 934-5 the same navy was defeated by Ikhshidid naval and land forces (*Khiṭaṭ*: 1.119; 2.103; 3.557). Yāqūt (*Buldān*: 1.884) reports that it was also during the Tulunid period that new cisterns were built at the city, perhaps to enhance its ability to withstand siege. Archaeological investigations at Tinnīs by the Supreme Council for Antiquities (SCA), and subsequent dating by Gascoigne (2003: 26), have dated vaulted cisterns excavated at the site to the eighth or ninth century – broadly in line with Yāqūt's account – as well as extensive cisterns of later date identified by Nicholas Warner (in Gascoigne 2007: 166-71).

In the 12th century, a new threat came in the form of Christian powers. Visiting in 1048, Nasir i Khusraw reports that "there is a fully armed garrison there as a precaution against attack by Franks and Byzantines" (*Safarnama*: 40). The danger from the former became a reality a century later. Sicilian Normans, emboldened by the enfeeblement of Egyptian navy at this time (Ehrenkreutz 1955: 102), attacked the city three times in the space of 25 years, plundering it in 548 AH (1153-4), besieging it unsuccessfully in 571 AH (1175-6), and occupying and burning it in 573 AH (1177-8) (al-Maqrīzī, *Khiṭaṭ*: 1.487-8). Of the first raid, Ibn al-Kalānisī says the Norman fleet:

> "... sailed up to the city of Tinnīs while its inhabitants were off their guard, made an assault upon it, killed, captured, enslaved and plundered, and retired with their booty three days later, leaving the place derilict." (*Dhayl*: 321-2).

The Norman attack on the Delta coast of 550 AH (1155-6) led by Guiliaume, son of Roger of Sicily, also passed close to Tinnīs, as did King Almaric of Jerusalem's excursion against Cairo in 1168 (al-Maqrīzī, *Khiṭaṭ*: 1.583). In 575 AH (1179-8), a Crusader squadron of 10 *ḥarārīq* warships based in Ashkelon plundered the area around Tinnīs (al-Maqrīzī, *Khiṭaṭ*: 1.583).

The Egyptian response to this onslaught was, at first, to strengthen the city's defences. According to al-Maqrīzī, the Fatimid Caliph Al-Āmir bi-Aḥkām Allah (1101-30) "built up Tinnīs and Dimyāṭ" (al-Maqrīzī, *Khiṭaṭ*: 4.105). Al-Maqrīzī says that the fear of further attack was so great that in 577 AH (1181-2), Salāḥ al-Dīn ordered the augmentation of the city's fortifications and renewal of its war-engines following a truce with the Kingdom of Jerusalem in 1180. A year later Christian ships molested Muslim ships within the lake, and captured a cargo (al-Maqrīzī, *Khiṭaṭ*: 1.735, 3.603; *Sulūk*: 1.1.72). Little more than a decade later, in 588 AH (1192-3), Salāḥ al-Dīn ordered the population of Tinnīs to

abandon the city for Dumyāṭ, leaving behind only a defensive force (al-Maqrīzī, *Khiṭaṭ*: 1.488-9). Ehrenkreutz (1955: 114) associates this withdrawal from Tinnīs with Salāḥ al-Dīn's realisation that the Egyptian navy was simply inadequate to the task of defending it.

Ayyubid defensive preparations for a Crusader attack on the Delta were vindicated in 1218-19 during the Fifth Crusade, when Crusader forces attacked and laid siege to Dumyāṭ. In November 1218, the Crusaders took Tinnīs. According to James of Vitry:

> "[God] made us masters of the town of Thanis [Tinnīs] with the citadel that is adjacent to it, with its eight tower which it is impossible take by force, and which cannot be besieged from any direction." (*Lettres*: 3.4.936v)

Oliver of Paderborn describes the city thus:

> "Our people, on their return from this expedition, told us that never had they seen a stronger citadel on flat terrain. It had seven very strong towers covered by domes. Moreover, all the way round, it was enclosed by two ditches, each of which was defended by a wall. It also had an advance wall. All around, the waters of a lake stretch over a broad space." (*Historia Damiatina*: 3.4.937r-v)

Beyond the citadel itself, however, Oliver says that Tinnīs was at his time "in ruins", supporting al-Maqrīzī's assertion that the city had been evacuated in the late 12th century.

The inability of Tinnīs to withstand siege in 1218 probably informed the decision of the Ayyubid Sultan al-Malik al-Kāmil to order the destruction of even the citadel of Tinnīs in September-October 1227 (al-Maqrīzī, *Khiṭaṭ*: 1.488-9).

Whether the site of Tinnīs was abandoned for good in 1227 is not clear. William of Tyre's accounts of the Crusade of King Louis of 1248 mention the existence of "le chastel de Tannis", although the fort does not take a rôle in this conflict as it did in the 1218-19 Crusader attack (Kamal 1932: 3.4.994r). When Ibn Baṭṭuṭah visited Tinnīs in 1326, he found it "destroyed" (*Tuḥfat*: 1.57). However, the state appears at least to have maintained a customs post there: Niccolò di Poggibonsi, arriving at Tinnīs from Beirut in 1345, says his ship was met by 30 'Saracens' who came out to his ship on a vessel called a "giarma" (*jarm*). He and his possessions were taken to Tinnīs, where he was searched. He found the city abandoned and mosquito infested (*Oltramare*: 84). In the 15th century, al-Qalqashandī (*Ṣubḥ*: 3.388) describes Tinnīs as "now a little village": ceramic finds at the site include Chinese porcelain from the Yong Li period (1403-24) (Gascoigne 2003).

That Tinnīs was a prominent city by the ninth century is apparent from the mathematical geography of al-Khawarizmī, who records it location along with just nine other major towns on Egypt's Mediterranean coast (*Ṣūrat*: 15-8). Al-Farghanī (*Ḥarakah*: 36-7) names

it as one of four coastal Egyptian cities. Thereafter, the city features too regularly in the historical data to warrant individual citation: the data imply it was one of the most important on Egypt's Delta coast until its evacuation in the late 12th century.

Historical assessments of the city's population vary wildly. The Patriarch of Antioch, Dionysius of Tell Mahre, put the population at 30,000 Christians when he passed through in 832 (Mouton 1998: 531). Nasir i Khusraw in 1048 put it at 50,000 men (*Safarnama*: 39). Around the same time, however, al-Bakrī puts it at 10,000 (*Mamālik*: 3.3.730v). The city remained largely Christian until the religious persecutions of the Fatimid Caliph al-Ḥākim, who al-Tinnīsī says ordered the destruction of 72 of the town's churches in 403 AH (1012-3) and their replacement with mosques (*Anīs*: 36). In the 12th century, Benjamin of Tudela said there were 40 Jews in the city (*Massa'ot*: 3.4.879r).

The changeable quality of the lake water has already been noted, and Tinnīs was almost entirely dependent on the Nile flood for potable water. According to Nasir i Khusraw:

> "For that time of the year, large, reinforced, underground cisterns called *maṣna'ah* have been constructed on the island. When the Nile water forces the salty sea water back, they fill these cisterns by opening a water course from the sea into them, and the city exists for the whole year on this supply."
> (*Safarnama*: 39)

The cisterns were filled at the height of the flood in the Coptic month of Tut, beginning 11 September, (al-Maqrīzī, *Khiṭaṭ*: 1.158)[2]

The city's food security situation was equally precarious. The island on which it stood was "all built up as the city" (al-Muqaddasī, *Aḥsan*: 201). And there was "... no cultivation and no herding ..." (Ibn Ḥawqal, *Ṣūrat*: 87). Apart from fishing and wildfowling (al-Maqrīzī, *Khiṭaṭ*: 1.289), the city was entirely dependent on food supplies shipped in from the mainland. Isḥaq ibn Ḥusayn reports that "flour and fruit" were supplied by boat from Dumyāṭ (*Ākām*: 403). This dependent situation made Tinnīs highly vulnerable to siege, while at the same time difficult for a foreign army to hold.

The economy of Tinnīs was dependent on the luxury textiles industry, on fishing, and on its *thughr* status. Al-Muqaddasī eulogises it:

> "What a city! A miniature Baghdad! A mountain of gold! Port of east and west! It has elegant markets and cheap fish. It is a destination town of evident prosperity, with a pristine coast, opulent congregational mosque, and towering

[2] Al-Mas'ūdī's claim (*Murūj*: 2.364) that the cisterns were filled in January – perhaps the last opportunity to do so during the year.

palaces. It is a bountiful and populous city – even though it is on a constricted island ... " (*Aḥsan*: 201)

He adds that "... in it are made coloured clothes and garments" (*Aḥsan*: 201). Indeed, from al-Ya'qūbī (*Buldān*: 337) onwards, Tinnīs is described as a city of luxury textile manufacture (Ibn Hawqal, *Ṣūrat*: 89; Nasir i Khusraw, *Safarnama*: 39, al-Bakrī, *Mamālik*: 3.3.730v, al-Maqrīzī, *Khiṭaṭ*: 1.489.90). According to al-Tinnīsī, the city contained 5,000 weavers' workshops, and 20,000 workers, "not including those, male and female, who striped and decorated the cloth." (*Anīs*: 37).

Fishing, meanwhile, was more than just a subsistence activity in support of the city's population. Al-Tinnīsī says the fishing industry yielded revenues to the state of 50,000 dinars a year, and had its own administrative *diwān* (*Anīs*: 37). The fleet comprised 372 boats of 16 types (*Anīs*: 38).

Tinnīs also emerges from the texts as a commercial port of considerable importance. Al-Ya'qūbī says "it is the anchorage of boats coming from the Levant and the Maghreb" (*Buldān*: 338). The eulogy of al-Muqaddasī, a century later, has already been quoted. In the 11th century, al-Bakrī puts Tinnīs on the sailing itinerary from Alexandria to Anatolia (*Mamālik*: 3.3.734v). Ibn Zulāq describes Tinnīs, alongside Dumyāṭ and al-Faramā, as "port of the lands of Byzantium, the Frankish periphery, Cyprus, the whole length of the Levant coast and the entrepôts of Iraq" (*Faḍā'il*: 3.2.685r).

Nasir i Khusraw says of Fatimid Tinnīs that it exported *buqalamun* textile "east and west":

" ... there are at any given time at least a thousand ships at anchor belonging both to private merchants and the sultan." (*Safarnama*: 39).

Al-Tinnīsī says that in his time: "The number of exporting *qawārib, kamā'im* and *'ashariyyāt* [types of vessel] that arrive from the Levant route each year is near five hundred." Within Egypt, he says that "... they come in from the regions of Cairo, Upper Egypt, Alexandria and the remote countryside. They are innumerable they are so many." (*Anīs*: 40)

Further indication of the scale of commercial activity at Tinnīs is suggested by the number of shops and *funduqs*. Nasir i Khusraw may well be exaggerating when he says there were 10,000 shops in the city, but his report is nevertheless indicative of a vibrant commercial scene. The native al-Tinnīsī puts the figure at 2,500 shops, of which 150 sold textiles (*Anīs*: 36-7). The importance of trade is indicated by the "good bazaars" described by Nasir i Khusraw (*Safarnama*: 38). Al-Tinnīsī says that "There were fifty *funduqs* and

secure markets; then, in the year 405 AH (1014/15), six extensions for large merchants were built ..." (*Anīs*: 36)

This buoyant commercial port activity at Tinnīs came to an end in the 13th century not as the result of change to the navigational environment, but because of a change in strategy by the Ayyubid leadership regarding the defense of the realm. The experience of di Poggibonsi and the maps of Piri Reis (Appendix 1, Figures 24-5) suggest the old route along the Tinnīs branch remained physically open in the 14th and 16th centuries. Rather, the city and its port were abandoned by *fiat* because of its defensive vulnerability. Tinnīs lost its status as "port of east and west" to Dumyāṭ – despite that city's navigationally more difficult position.

Dumyāṭ

Dumyāṭ (Damietta) is the only port of the eastern Delta to have functioned continuously since before the Islamic conquest to the present day – and even then much changed in form and even location (see Figure 5.1 and Figure 5.8). Before its emergence under Salāḥ al-Dīn as the pre-eminent port of the eastern Delta, the city's representation in the historical record is less prominent than that of Tinnīs, reflecting the superior position of the latter as a commercial port until that time.

The site of medieval Dumyāṭ is not known, other than that it lay on the east bank of the river, downstream of modern Dumyāṭ, with Lake Tinnīs close by. The earlier site was abandoned by Muslim forces after they recaptured it in 1250 following the Crusade of St. Louis, and a new Dumyāṭ was founded further upstream. Hayton says of the new city:

> "The Saracens ... made neither walls nor fortifications. This land is called the new Damiete, and old Damiete is entirely deserted ..." (*Flor*: 4.1.1130r)

The remains of the earlier city are no longer visible, and may have been swept away by the meandering river.

Dumyāṭ was an established town on the eve of the Islamic conquest (George of Cyprus, *Description*: 176), but its early Islamic history is obscure. While the Christian author John of Nikiou, writing soon after the events, says, 'Amr took over 15 years to subdue northern Egypt, including Dumyāṭ (*Chronicle*: CXV), the tradition of al-Jayshānī already cited in relation to Tinnīs claims that Dumyāṭ also capitulated under the same terms as Babylon (al-Baladhūrī, *Futūḥ*: 216-7). Meanwhile al-Maqrīzī (*Khiṭaṭ*: 1.581-2) says that the defending Byzantine governor of the city, al-Hāmūk, was betrayed by his son, who converted to Islam and subsequently led the conquest of Tinnīs.

These conflicting historical accounts at least establish Dumyāṭ's existence at the time of the conquest. In common with other sites, however, there is little historical data pertaining to the city before the ninth century, although the city warranted inclusion in the geographies of al-Khawārizmī (*Ṣūrat*: 15-8) and al-Farghānī (*Ḥarakah*: 36-7). Dumyāṭ gave its name to anministrative *kūrah* (Ibn Khurdādhbah, *Masālik*: 82; Qudāmah, *Kharāj*: 247), and was an episcopal seat (Leon the Wise, *List*: 3.1.491r). Al-Ya'qūbī makes early reference to Dumyāṭ's luxury textiles industry *(Buldān: 338),* but he does not note a port function for the city as he did for Tinnīs. The tenth century geographies give little information about Dumyāṭ beyond briefly noting its astronomical location, its situation between a Nile branch and the Lake Tinnīs, or its textiles industry (*Kitāb Ṣūrat al-Arḍ*: 3.1.555r; Ibn Ḥawqal, *Ṣūrat*: 87, 90, 101; Ibn Rustah, *A'lāk*: 90; al-Iṣṭakhrī, *Masālik*: 52, al-Mas'ūdī, *Murūj*: 1.264-5; Qudāmah, *Kharāj*: 247; Suhrāb: *'Ajā'ib*: 48). Al-Muqaddasī, who eulogised Tinnīs, also lauds Dumyāṭ. It is, he says:

> "...better , more spacious, wider, more expansive, more frequented; it has more fruit, is better built, has more water, more skilled artisanship, finer cloth, cleaner workmanship, finer bathhouses, stronger walls, and fewer vexations compared with Tinnīs. On it [the 'island' of Dumyāṭ] is a stone fortress with gates, and in it there are many busy garrisons. They have a season every year when troops go there from all parts." (*Aḥsan*: 201-2)

However, like his fellow tenth century authors, al-Muqaddasī has nothing to say directly of Dumyāṭ as a port, in stark contrast to his description of Tinnīs already cited. Indeed, the only pre-Fatimid authors to discuss Dumyāṭ as a port are Isḥāq ibn al-Ḥusayn and Ibn Zulāq: The former refers to its overseas trade:

> "It is in the Levantine Sea ... From Dumyāṭ one sails to the Byzantine lands. The islands of Cyprus and Crete are close to it in the sea. From there flour and fruit are carried to the anchorages of Dumyāṭ and Tinnīs." (*Ākām*: 403).

Meanwhile Ibn Zulāq, in his already-cited passage describing Egypt as "entrepôt of the world" assigns Dumyāṭ a parity with Tinnīs and al-Faramā as a port of the eastern Delta (Faḍā'il: 3.2.685v)

The historical texts similarly provide little data on Fatimid Dumyāṭ, during which time Tinnīs was flourishing. The city had no eye-witness visitor such as Nasir i Khusraw. Even al-Idrīsī does little more than establish the city's location. Its prosperity as a textiles centre appears to have continued, however. Yaqūt reports the accounts of "reliable merchants" that in 1007-8 luxury robes from the city were sold for large sums (*Buldān*: 2.603).

The accounts of the conquest above imply that Dumyāṭ was already fortified in the late Roman period. In the early 8th century it was, like other coastal cities, subject to Byzantine naval attacks – al-Maqrīzī cites raids in 708-9, 738-9 and one in 'two hundred and something' – that is, between 815 and 825. Following the Byzantine sack of the city in 852-3, al-Mutawakkil had the city walled (Ibn Mufraḥ, *Siyar*: 1.582-3; al-Maqrīzī, *Khiṭaṭ*: 1.582-3; Yāqūt, *Buldān*: 2.604).

The defenses appear to have been effective. Al-Maqrīzī reports that, soon after, the Byzantines landed on the coast with 200 ships, and, having pillaged the region for a month, were driven off without taking the city. Following the death of the last Ikhshīdid ruler Kāfūr in 968, the city was again attacked, unsuccessfully, by an opportunist Byzantine fleet (al-Maqrīzī, *Khiṭaṭ*: 1.589).

It is with the Crusader targeting of Egypt in the late 12th century that Dumyāṭ gains prominence in the historical record. Like Tinnīs, Dumyāṭ found itself the target of raids by the Sicilian Normans in the dying years of Fatimid rule. Al-Maqrīzī (*Khiṭaṭ*: 1.583) records one such raid in 1153, when Alexandria, Rashīd and Tinnīs were also targeted.

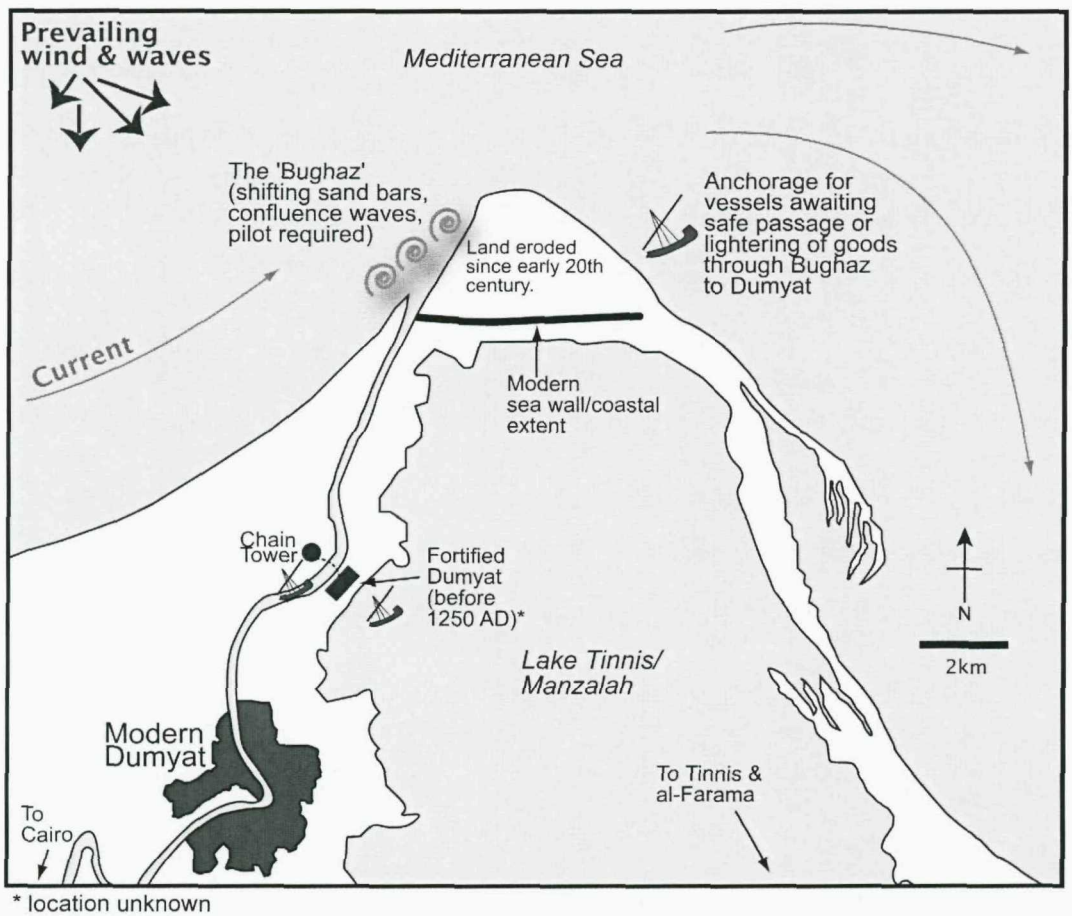

Figure 5.11: The port of Dumyat, showing its problematic navigational link to the Mediterranean via the Rashid mouth, or Bughaz. The Dumyat promontory has eroded significantly since the building of Nile dams at Aswan in the 20th century (Frihy and Lawrence 2004).

However, it is in the accounts of the 1169 Crusader and Byzantine offensive against Egypt under King Almaric I that Dumyāṭ emerges as perhaps the principle fortification of the eastern Delta. William of Tyre, who participated in the excursion, describes a chain slung across the Dumyāṭ mouth between a tower on one bank and the city on the other (*Historia*: 2.363). The invaders were unable to break the chain and prevent the city receiving supplies from upstream: they were ultimately forced to withdraw (Abū Shāma, *Rawḍatayn*: 4.151; al-Maqrīzī, *Khiṭaṭ*: 1.584; William of Tyre: *Historia Rerum*: 2.363).

The successful repulsion of the Crusader attack helps us understand Salāḥ al-Dīn's ultimate decision to evacuate Tinnīs in 1192-3: the ability of Dumyāṭ to withstand the 1169 siege had largely been due to the chain, a device that could not be deployed to the same effect at Tinnīs.

Authors later than William of Tyre describe Dumyāṭ's chain tower as surrounded by the river rather than standing on the opposite bank – making the task of breaking the chains even more difficult. The discrepancy with earlier accounts may be explained by changes to the defenses that Salāḥ al-Dīn effected early in the 1180s, and which al-Maqrīzī says in his *Kitāb al-Sulūk* (1.1.72) included adding a second chain. Al-Maqrīzī (*Khiṭaṭ*: 1.584-5) says the work was done in 577AH (1181/82), and included increasing weaponry on two towers, fixing boats to the chains to fend off attacks between the towers, and repairs to the city walls – all at a cost of 1 milion dinars. A decade later, surrounding orchards were cut down, trenches dug, and a bridge built alongside the chain.

Later Crusader accounts appear to confirm al-Maqrīzī's description. James of Vitry also says that there were two chains between tower and city (*Lettres*: 3.4.936v). He and Oliver of Paderborn (*Historia Damiatina*: 67) say there was also a pontoon bridge. The anonymous *De Situ Civitatum Egypti Regalium* (3.4.933v), written soon before 1218-19, when the city was again besieged, describes Dumyāṭ as:

> "... defended by a double ring of walls, and by a large ditch [also] provided with walls. This town is adorned with 28 high towers, and one knows not exactly by how many lower towers. In the middle of the Nile, opposite the tower of the Sultan, one finds a strong and high tower, from the foot of which to the tower of the Sultan extends a large iron chain. This is firmly fixed to the two towers..."

Although ultimately overcome by the Crusaders, the tower-and-chains arrangement proved its worth, allowing the city to hold out for four months during the 1218-19 siege (James of Vitry, *Lettres*: 3.4.936v). According to Oliver of Paderborn:

> "...we realised that the tower could neither be captured by the blows of petraries or of trebuchets (for this was attempted for many days); nor by bringing the fort closer, because of the depths of the river; nor by starvation, because of the surroundings of the city; nor by undermining, because of the roughness of the water flowing about." (*Historia Damiatina*: 64)

Christian and Muslim authors alike recognised Dumyāṭ's advantages. In a letter to Pope Innocent III written in 1214, ahead of the Fifth Crusade, the Patriarch of Jerusalem describes the city as "chief and key of all the cities and all the castles of all Egypt" (Kamal 1932: 3.4.932v). Abū Shāma (*Rawḍatayn*: 167-8) says that when news of the fall of the city in 1219 reached al-'Ādil, son of the Ayyubid ruler al-Malik al-Kāmil, in Damascus he "... fell deathly ill." Abū Shāma explains al-'Ādil's response:

> "This chain, for its part, bars the passage of ships which, in time of war, wish to go further. Therefore, it is truly the key of Egypt."

In fact, al-'Ādil's fears were not realised, and Ayyubid forces were able to re-take the city in 1222, following a disastrous Christian advance against Cairo (Runciman 1954: 168-9; Van Cleve 1969: 424-8).

Dumyāṭ was besieged for a final time during the Seventh Crusade. The forces of Louis IX surprised and quickly took the fort, but then refused to hand it over to the nominal king of Jerusalem as had previously been agreed. They again attempted to advance against Cairo. However, funneled by the Dumyāṭ and Tinnīs branches to Manṣūrah (see Figure 5.8), they met the Muslim army there, and were routed (Strayer 1969: 501-4) (*L'Estoire de Eracles*: 3.5.994v).

Following the Muslim recapture of Dumyāṭ in 1250 A.D, the first Mamluk ruler of Egypt al-Mu'izz 'Izz al-Dīn Aybak ordered the destruction of the city's walls to prevent a recurrence of the Crusader seizures of the city. This was done in April 1250: "Nothing remained except the congregational mosques," says al-Maqrīzī (*Khiṭaṭ*: 1.607).

The accounts of the siege of Dumyāṭ contain additional references to the city's port function. Again, the chain features prominently, this time as a means of controlling and taxing trading activity into and out of Egypt – much as the bridge of al-Fusṭāṭ. The Patriarch of Jerusalem's 1214 letter to Pope Innocent III says that, thanks to the chain:

> "No one may come to Egypt or in [its] narrow islands except by permission of the Sultan. When there, the Sultan, lord of Babylon, receives large rents from the boats charged with many goods from Venice or Antioch or other lands." (Kamal 1932: 3.4.932v).

The *De Situ Civitatum Egypti Regalium* provides additional data on the nationalities of the vessels passing through Dumyāṭ:

> "...[The chain] is firmly fixed to the two towers in such a manner that, without the permission of the Sultan, king of Babylon, the ships arriving from Venice, Antioch, Genoa, Armenia, Greece, Egypt and the other ports and islands of the sea, charged with all riches, cannot ascend or descend the river. It is for this reason that the Sultan possesses such infinite revenues and riches." (3.4.933v).

The *Gesta Crucigerorum Rhananorum* of 1217-19 says that:

> "this chain, according to custom, is only opened for the purpose of freeing the passage for merchants who make every effort to come and fill Egypt with their products, on the condition that they make the obligatory payments" (3.4.938r)

Thus, even during the peaceful interludes of the Crusades, Egypt was trading with the Christian Mediterranean as far away as Italy. By the 13th century, goods passing through the eastern Delta had no choice but to pass through Dumyāṭ. Hence later travellers through the eastern Delta (Palerne, *Peregrinations*: 174; Sandys, *Relation*: 116; Wild, *Reysbeschreibung*: 11; Coppin, *Relation*: 303; Stochove, *Voyage*: 4) passed through the Dumyāṭ mouth, as discussed in Section 4.

Summary

From the above account, a process of radical reconfiguration of the ports of the Nile's eastern Delta can be seen to have taken place in the medieval period. Al-Faramā survived the loss of its Nile branch by some two centuries, because it served an alternative function as port of the Isthmus of Suez. That latter function was in turn, however, contingent on Egypt remaining a political province, to be bypassed by commercial trade in luxury goods. When Egypt became an independent polity—and indeed from the Fatimid period the centre of empire – the utility of this route for Egypt's rulers was undermined: goods that had passed through the Isthmus were now expected (we shall see) to pass through the Nile valley itself, where they could be controlled and taxed. Nearby Tinnīs at first took on the mantle of main port of the eastern Delta, aided by its sheltered position inside the lake, and the potential to avoid the Dumyāṭ mouth. Again, however, the decider of its fate was not related to its inherent navigational advantages, but to the defensibility of the city. Tinnīs was obliged to yield to Dumyāṭ as a city better defended against surprise attack from across the sea. In the end, navigators, who once travelled via Lake Tinnīs, were now obliged to negotiate the vicissitudes of the Nile mouth, or lighter goods through it. It was by this route that the state insisted goods pass, to be taxed at the chain of Dumyāṭ.

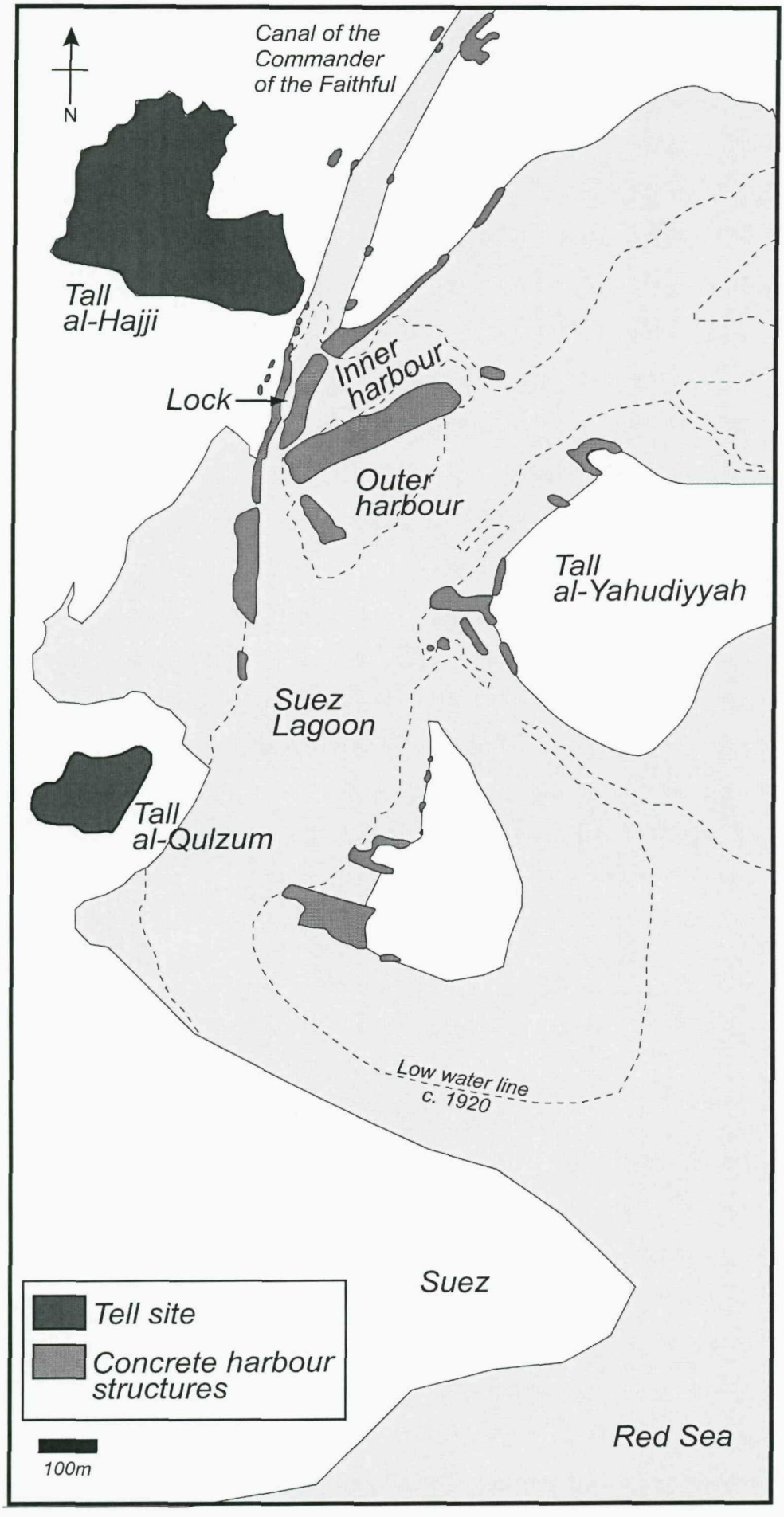

Figure 5.12: Interpretation of the harbour of al-Qulzum in the lagoon of Suez, after Bourdon (1925: carte 7, 8, 9).

5.4 The Nile valley and the Red Sea connection

The ports of Egypt's Red Sea coast may seem at first remote from the Nile network (see Figure 4.7 and Figure 5.1). However, they are informative of the choices made in establishing a trade route, and the factors involved in making those choices. Both the Nile and the Red Sea offered themselves as north-south conduits for maritime trade between southern Red Sea and Indian Ocean on the one hand, and northern Egypt and the Mediterranean on the other. The choice was which route to take, and where to place the connecting ports. Placing a port far to the south, such as at 'Aydhab, allowed northbound vessels to shorten their battle against the northerly winds prevalent above 20°N. However it made for a considerably longer journey across the desert (see Figure 4.7), and in addition cargoes arriving at the Nile from the Red Sea in the early summer – the time of inbound arrivals – would probably have had to wait for the Nile to start to flood and so become navigable, or else face a slow and potentially dangerous journey on the river (see Section 4.6). The alternative – from the Ayyubid period onwards – was to beat north for another 470km to al-Quṣayr, where the connection by land to the Nile was some two weeks shorter. In the earliest centuries of Islam, however, the chief port of the Egyptian Red Sea was al-Qulzum, at the northern tip of the Gulf of Suez: in its case, the Nile valley was entirely bypassed and exposure to the conditions of the northern Red Sea maximised.

Al-Qulzum

Roman Clysma became al-Qulzum (see Figure 5.1 and Figure 5.12) with the Islamic conquest. Its importance grew immediately, in part as a result of the re-excavation of the Nile-Red Sea canal, through which food was supplied to the Ḥijāz. For a time, luxury goods were traded across the Isthmus of Suez via the port, making 'Abbasid al-Qulzum a prosperous emporium of east-west trade. It was only in the Fatimid period, when the trade in luxury goods was diverted to Cairo via the southern port of 'Aydhāb and the Nile valley, that its importance waned.

Port activity at al-Qulzum following the Islamic conquest is at first closely linked to the reconstitution of the Nile-Red Sea canal at the behest of the Caliph 'Umar in 23 AH (643-4). According to al-Kindī (before 961), it was completed in six months, and ships were arriving in the Ḥijāz by the seventh (in al-Maqrīzī, *Khiṭaṭ*, 3.474).

The earliest Islamic-era source on the canal is the Egyptian Ibn 'Abd al-Ḥakam (d. 829), whose history is a compilation of earlier anecdotal traditions. Four of these relate to the Muslim re-excavation of the canal (*Futūḥ*: 163-6). The first (*Futūḥ*: 164) relates that, during the famine year of al-Ramādah (17-18 AH (639-640)) 'Umar appealed to 'Amr ibn

al-'Ās in Egypt to send supplies to relieve the holy cities of Makkah and al-Madīnah. 'Amr responded with camel caravan so long that "its first [camel] was in al-Madīnah, while its last was still in Miṣr."

However embellished the story, the harsh experience prompted 'Umar to write to 'Amr:

> "God has conquered Egypt for the Muslims, a land of much goodness and food ... [S]ince God ... made it an asset for them, I should excavate a canal from its Nile, flowing into the sea. It will be easier when we want to transport food to al-Madīnah and Makkah ... Go, you and your companions, and consult about it..."

'Amr's consultations prompted consternation in Egypt, and an exchange of letters in which the Egyptians resisted, and 'Umar insisted. In the end, the Egyptians capitulated:

> "['Amr] excavated the canal on the edge of al-Fusṭāṭ that is called the Canal of the Commander of the Faithful, running it from the Nile to al-Qulzum. He did not rest until ships were sailing in it, carrying what food was needed to Makkah and Madīnah..."

The second tradition (*Futūḥ*: 164-5) suggests that 'Umar's idea for the canal arose from a memory of a pre-Islamic trade with Egypt through the Roman canal. In complying with with 'Umar's demands for a canal:

> "'Amr said: 'As you will, Commander of the Faithful. You know that before Islam, ships used to come to us carrying traders of the people of Egypt. When we conquered Egypt, that canal was cut, having been blocked off, and the traders had abandoned it."

That the Arab canal was essentially a re-excavation of its Roman predecessor is stated explicitly by al-Fardān, writing around 828. He says:

> "... the river of Trajan which passed Babylon of Egypt as Ptolemy describes precisely, is the same as that called the Canal of the Commander of the Faithful ... " (Bourdon 1925: 6)

This second tradition also notes Egyptian resistance to the idea, and is more explicit as to where this reluctance emanated. Egypt's indigenous Coptic leaders asked:

> "'... you will start and export the food and produce of your land to the Ḥijāz, [thereby] ruining it? If you are able to do it, it will be a burden."

Again, however, Umar's will prevailed, and 'Amr promised:

"'Nothing will be carried on this sea except provisions for the people of al-Madīnah and Makkah.'" (*Futūḥ*: 165)

The third tradition (*Futūḥ*: 165) indicates that the export was essentially Egyptian agricultural produce. 'Umar orders:

"Do not store in Egypt any of its food, textiles, onions, lentils and vinegar without sending some of it to us".

Later Christian authors Eutychius (*Naḍḥm*: ٧٤) and Abū Sāliḥ (*Tārīkh*: 3.1.566r) say the ships carried barley and wheat.

Ibn 'Abd al-Ḥakam's final tradition (*Futūḥ*: 165-6) reports that a Coptic informant showed 'Amr the route of the canal in exchange for exemption from the *jizyah*[3] tax.

These traditions give a plausible indication of the perceptions of the benefits accruing from the canal among the various interest groups. 'Umar's insistence that the canal be excavated is to be compared with the entrenched opposition of the native Egyptian leadership. Each, from their own perspectives, could see the same one-sided outcome: that the canal would divert a portion of Egypt's agricultural wealth to the benefit of the new empire. In this, the Nile-Red Sea canal route mirrored the Roman Empire's exports of Egyptian grain via Alexandria to Rome and Constantinople. Once again, Egypt was a subject province paying agricultural tribute to an overseas master.

The export of agricultural produce through the canal to the Ḥijāz continued beyond the immediate crisis, surviving the shift of the Islamic capital from al-Madīnah to Damascus in 661, and lasting as noted until some time in the mid-eighth century.

Ibn Tuwayr gives some detail about shipping practices in the canal. According to him:

"The Nile vessels unloaded what they had transported from the regions of Egypt, and having unloaded, they loaded in al-Qulzum whatever had arrived from the Ḥijāz and elsewhere [and took it] to Egypt. In its time it was a well know route for traders and others." (*Nuzhat*: 203).

These references to transshipment accord with the earlier accounts of Strabo (*Geographia*: 17.1.25) and Diodorus of Sicily (*Bibliotheca*: 1.33) that there was a 'lock' at the Red-Sea end of the Ptolemaic canal. Such a lock might have three functions: to keep the water in the canal potable; to allow passage between the canal and the sea across a six-foot tidal gradient; and to prevent water draining from the canal, thus extending the shipping season.

[3] The Muslim poll tax for non-Muslim subjects

Bourdon also identified what he interpreted as a lock among the concrete quay structures he identified at al-Qulzum (Bourdon 1925: 143-4)(see Figure 5.12).

When the canal was not open, camels carried grain to al-Qulzum. This is suggested in a passage from al-Kindī, which relates that the governor of Egypt, al-Walīd bin al-Rifā'ah al-Fahmī (727-735), settled a number of Arab tribes on agricultural land at Bilbays, an area that had not yet been settled by Arabians:

> "He settled them in Bilbays and ordered them to farm. He looked to the alms from land-taxation, and allocated these alms to them. They bought camels, and transported the food to al-Qulzum. A man would earn ten dinars a month, more or less." (*Wulāt*: 77-8)

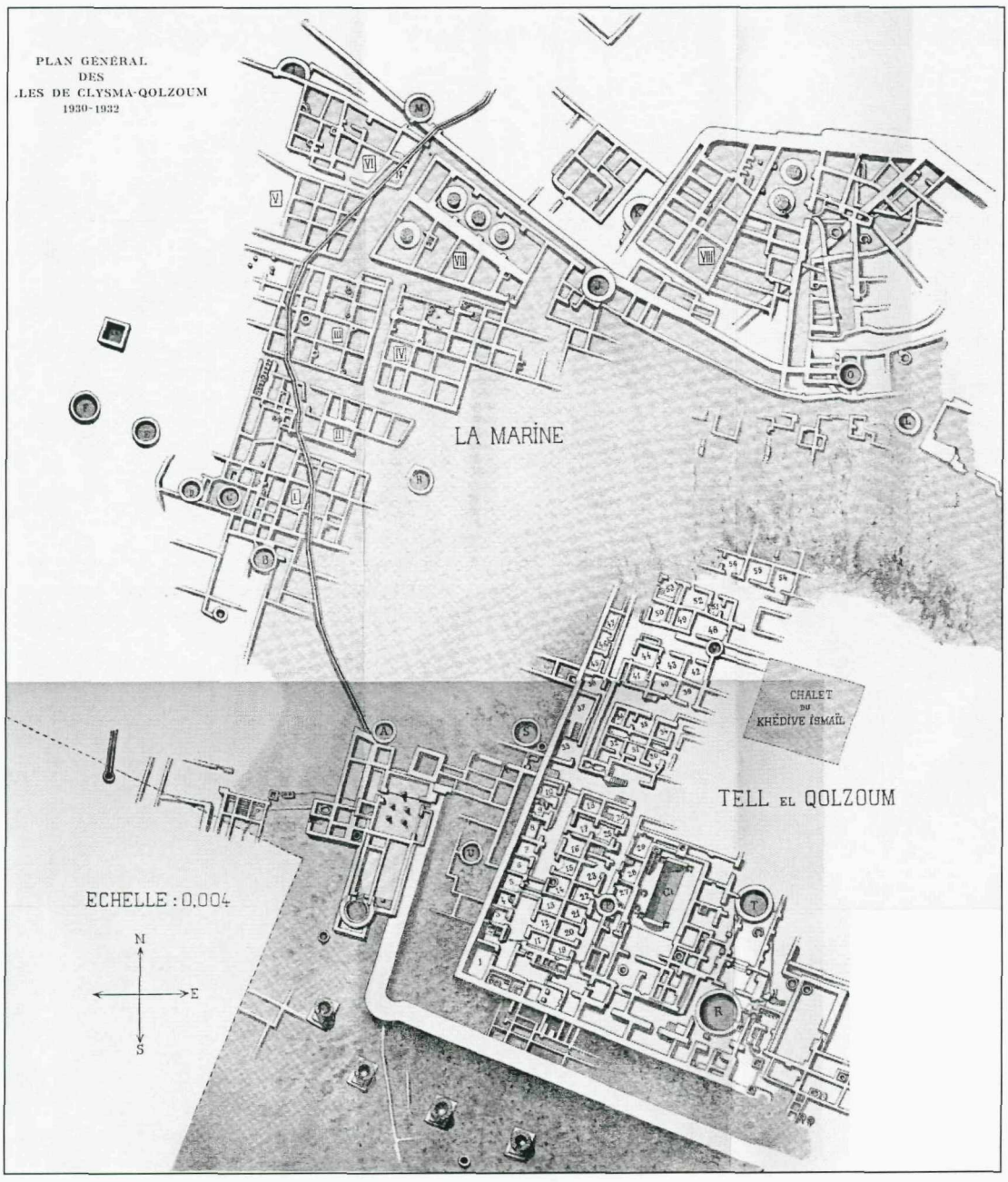

Figure 5.13: Bruyere's plan of his excavations at Tall al-Qulzum, 1930-32 (Bruyère 1966: Plan Général)

The fact that these caravans were instituted around thirty years before the canal was blocked suggests that they operated in parallel with it, presumably at times when the canal was dry.

According to Ibn Qudayd, the Abbasid Caliph al-Manṣūr (754-75) ordered the closure of the canal "...when Muḥammad bin 'Abd al-'Allah bin Ḥassan rebelled against him in al-Madīnah, to cut off food from him." (al-Maqrīzī, *Khiṭaṭ*: 3.474). According to al-Baladhūri (*Ansāb*: 1.269) al-Manṣūr said: "Write now to Egypt that supplies be cut off from the two holy places. They will be in crisis if food does not come to them from Egypt."

Having been cut off from the sea, the canal nevertheless continued to function along part of its length. In the 12th century, Abū Sāliḥ says grain was carried as far as al-Sadīr, somewhere in the central Wadī Ṭumaylat. There: "The wheat is transferred by land to the *jilāb* [a vessel type] that go to Makkah and the Ḥijāz." (*Tārīkh*: ٧٤).

The chronology of the Islamic-era Nile-Red Sea canal therefore correlates closely to geopolitical power shifts during that era. It was excavated immediately after the Islamic conquest, reflecting the wresting of control over Egypt from the Byzantine Empire, and Egypt's new relationship with the Ḥijāz. It remained open for as long as the Ḥijāz was a centre of political power within the Islamic empire. The Islamic capital may have moved to Umayyad Damascus in 661, but the Arab Umayyad dynasty that took power that year continued to draw support from its ancestral homeland, the Ḥijāz. It was only following the 'Abbasid revolution of 750 that the pre-eminence of the Ḥijāzi aristocracy was brought to an end. Just as the recreation of the canal signaled the geopolitical reorientation of Egypt, so too did its closure: the blockage reflected Egypt's political and economic re-orientation as the Islamic capital shifted to 'Abbasid Baghdād.

After al-Khawārizmī's inclusion of al-Qulzum's astronomical location in his mathematical geography (*Sūrat*: 13), there is a dearth of historical data on the port from the late eighth and early ninth centuries. However, the closure of the canal appears to have represented only a temporary interruption in the supply of Egyptian grain to the Ḥijāz. In the tenth century, al-Muqaddasī says of Bilbays, where Arab tribes had been settled a century earlier:

> "It is from here that most of the provisions of the Ḥijāz, flour and pastry, are transported. I have calculated that, at certain times of the year, this reaches three thousand camel-loads a week, all of it flour or grain." (*Aḥsan*: 195).

Elsewhere, he implies that these provisions were shipped on to the Ḥijāz by sea. Being without water or agriculture of its own:

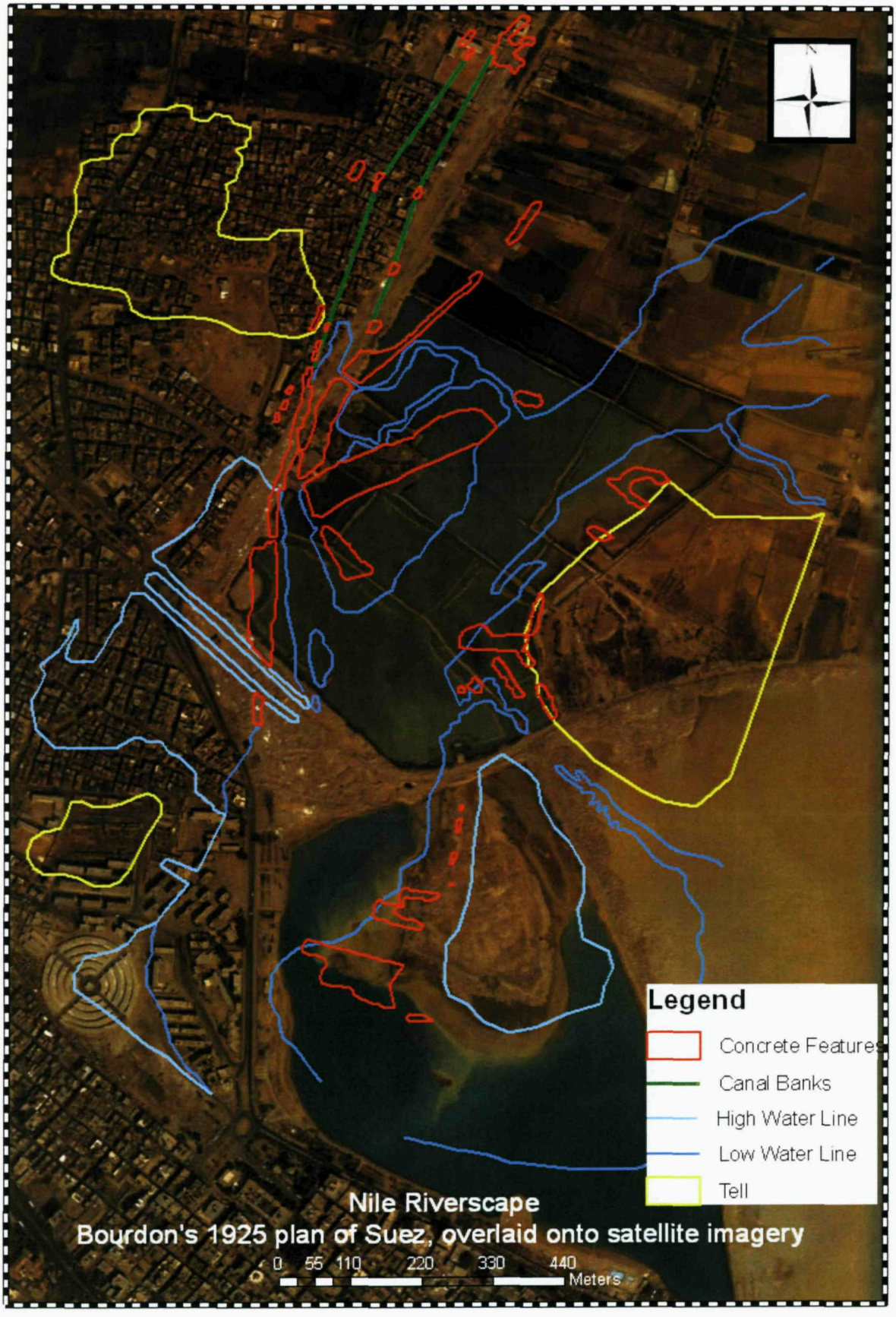

Figure 5.14: Bourdon's cartography of the ancient port of al-Qulzum overlaid onto modern satellite imagery. Bourdon's features are indicated with coloured lines (see Legend). The boundary of Tall al-Qulzum, excavated by Bruyère, is indicated by the lowest yellow line (Google Earth™).

> "The provisions of al-Qulzum come from Bilbays ... [al-Qulzum] is the storehouse of Egypt and the port of the Ḥijāz." (*Aḥsan*: 195-6)

As Abū Sāliḥ indicates, this export of food to the Ḥijāz appears also to have been in place as late as the 12th century.

Al-Qulzum's position at the southern end of the Isthmus of Suez – the shortest route between the seas – made it an important port in the early centuries of Islam. According to al-Mas'ūdī the Muslims were aware of the potential of this land crossing from the outset. He claims that 'Amr bin al-'Ās had proposed excavating a canal across the Isthmus soon after the conquest, but that the idea had been rejected by 'Umar for fear that the Byzantine navy would use it (*Murūj*: 4.98).

The trans-Isthmus caravan trade was vital to the prosperity of al-Qulzumi the ninth century, as Ibn Khurdādhbah's passage concerning the trade of the Rādhāniyyah traders, quoted above, reveals. Around the same time, al-Ya'qūbi (d. 897) says of al-Qulzum:

> "It is a great city on the sea coast, in which are the merchants who prepare supplies from Egypt to the Ḥijāz and Yemen. It has an anchorage for ships, and its inhabitants are a mixture of people. Its merchants are a prosperous people." (*Buldān*: 340)

By these descriptions, late ninth-century al-Qulzum appears both as an export point for Egyptian agricultural produce and a staging-post for luxury items moving between the eastern and western seas. Ibn Khurdādhbah suggests an Egypt being bypassed in terms of trade in prestige goods. He gives no itinerary between al-Qulzum and al-Fusṭāṭ, even though his work is a book of 'routes and provinces' (*al-masālik wa-l-mamālik*), though he does include other itineraries within the Delta. The destinations he describes in relation to the Rādhāniyyah traders are either the sources of the goods or major political centres that constituted markets for them – Baghdād, Constantinople, the Frankish lands, Aghlabid Sicily, the independent Emirate of Cordoba, and Asian polities. The omission of Egypt is reflective of its provincial status at that time. Meanwhile, al-Ya'qūbī suggests that the al-Qulzum was still supplying Egyptian foodstuffs to Arabia.

Al-Qulzum's hub status continued into the tenth century. Al-Iṣṭakhrī describes it as a highly developed port linking Egypt and the Levant with the Hijāz, Yemen and other Red Sea destinations (*Masālik*: 33). Isḥāq ibn al-Ḥusayn calls al-Qulzum "the treasure trove of merchants", with connections to India and Makkah, the latter via Jiddah (*Ākām* : 405).

Al-Mas'ūdī (d. 956) says that:

"...to it, from all the kingdoms that fringe these two seas [i.e. the Mediterranean and Red Seas] are transported varieties of fine objects, luxury goods, and treasures; aromatics, medications, jewels and slaves, and also types of food and drink and clothes. All countries ship goods there and unload them." (*Tanbīh*: 20)

He also mentions Muslim vessels crossing the Indian Ocean "to the land of India, China, al-Jiddah and al-Qulzum" (*Tanbīh*: 55).

At the end of the tenth century – the early decades of Fatimid rule – Ibn Zulāq says of Egypt:

"... from its coast at al-Qulzum [goods] are transported to the two shrines, Jiddah, Oman, India, China, Ṣan'ā, Aden, al-Shiḥr [in Yemen], Sind and the islands of the sea ..." (*Faḍā'il*: 3.2.685).

The port's decline seems to have come about soon after, however. Ibn Ṭuwayr writes:

"In the past it was one of the coast[al frontiers] of the Egyptian state. I saw something of the accounts of its public servants in the Palace legers, and what was spent on its governor, judge, preacher (*dā'ī*), sermon-giver, the soldiers based there to protect it, other ranks, its congregational mosque and prayer-house. It was populated and settled." (in al-Maqrīzī, *Khiṭaṭ*: 1.579).

The Fatimid withdrawal from al-Qulzum appears to post-date 997, since al-Musabbiḥī says that in that year that the Caliph al-Ḥākim gave the inhabitants of the port the customs duties collected there during Ramadan (al-Maqrīzī, *Khiṭaṭ*: 1.579).

By the 12th century, al-Idrīsī (*Nuzhat*: 4.348) describes al-Qulzum (and neighbouring Suez) as "mostly destroyed, because of the attacks on them by the Arabs [i.e. nomads]". However, elsewhere (*Nuzhat*: 1.44, 50; 4.348-9) he says that ships were still being built there, and that vessels from al-Qulzum visited the Abyssinian port of al-Zāligh to trade in "slaves, silver and a little gold." Elsewhere he says that "... *the vessels of al-Qulzum* going to Yemen must pass through [Bab al-Mandab]". Around the same time, al-Zamakhsharī says that ships from al-Qulzum were to be seen at al-Jār, the port of al-Madīnah (*Jibāl*: 3.3.797r).

Writers in the thirteenth and fourteenth centuries describe al-Qulzum and adjacent Suez as either destroyed, abandoned, or only sparsely inhabited (Yā'qūṭ, *Buldān*: 4.160; al-Dimashqī, *Nukhbāt*: 165; Abū al-Fidā', *Taqwīm*: 1.23; al-Nuwayrī, *Nihāyat*: 1.242; al-Maqrīzī, *Khiṭaṭ*: 1.578). Al-Maqrīzī notes that the name Suez had by his time replaced that

of al-Qulzum. By 1405, Ibn Khaldūn gives 'Baḥr al-Suways' as the name of the sea, rather than Baḥr al-Qulzum as had been common previously (*Muqaddimah*: 4.3.1340v).

The tell site of the town of al-Qulzum at modern Suez (see Figure 5.13) was excavated extensively by Bruyère in the 1930s, but the published results are extremely limited (Bruyère 1966). These indicate extensive settlement of Tall al-Qulzum in the Ptolemaic and Roman (particularly late Roman) eras, as well as some Islamic-era settlement: they identify two madrasas on the site, yielding associated (unpublished) manuscripts (Bruyère 1966: 43). Published archaeological indicators of Islamic-era activity at the site are limited to Arabic inscriptions on bone and pulleys, physically complete ceramics, and fine-quality carved ivory and serpentine stone items (Bruyère 1966: pl. XXIII, XXIX, XXV, XXXIII-V). The site has since been extensively overbuilt. Bruyère's plan of the tell site is show in Figure 5.13– its general location on modern satellite imagery – buried beneath the modern city – is indicated in Figure 5.14.

The ancient harbour of al-Qulzum was investigated by Bourdon in the early 1920s (Bourdon 1925: 133-154). His survey of the site recorded extensive – although undated – concrete harbour structures comprising what he interpreted as a lock area, an inner tidal basin, and extensive quays forming an 'outer' harbour zone (see Figure 5.12 and Figure 5.14). The site has altered radically since the 1920s – much of it subsumed by a fish farm, a modern rubble dump, roads and buildings (see Figure 5.14). Even in the 1920s, Bourdon reported that the concrete was being extracted for building material (Bourdon 1925: 153). The lagoon itself is today connected to the open sea by a canal. Visual inspection during brief visits to the site by this author in 2006 and 2007 revealed small traces of what might be the concrete Bourdon recorded among an otherwise transformed site, but further investigation is required to confirm these observations, and to date the structures. Given the apparent integration between these structures and the mouth of the Nile-Red Sea canal, it is likely that these were the structures used during the early Islamic and Roman periods.

'Aydhāb

Apart from al-Qulzum, 'Aydhāb is the only Egyptian Red Sea port to which the historical texts refer before the 12th century, when al-Quṣayr – modern al-Quṣayr al-Qadīm and the site of Roman Myos Hormos – was re-occupied under the Ayyubids.

Today, 'Aydhāb is located in the Halayb triangle, an Egyptian-administered zone claimed also by Sudan – reflecting the same political liminality that characterised it in the medieval period (See Figure 5.1 and Figure 5.15). The site was identified at Suwākin al-Qadīm (22° 20' 0" N, 36° 29' 32 E) by Bent (1896: 336), who found "no other traces elsewhere along this coast of any other town".

The archaeological data pertaining to 'Aydhāb is limited. Bent, visiting in 1895, believed the settlement had once been an island, or else a moat, now silted, had been excavated on the landward side. Murray (1926: 239), visiting thirty years later, thought it had never been an island, natural or otherwise. He said the cemetery was very large compared to the town: a reflection, he says, of "the unhealthy nature of the pilgrim traffic". Both observed three large cisterns. Murray also observed houses made of rubble stone, and the outline of a mosque (Bent 1896: 336; Murray 1926: 239).

Datable material spans the 8th-15th centuries. Glass from the site has been dated from the 8th-15th centuries (Harden 1955). Murray found a coin struck by al-Ḍhāhir Baybars, and "many fragments of Chinese porcelain and celadon ware of the twelfth to fifteenth centuries". He also found fragments of Ming celadon and blue-and-white porcelain, suggesting that trade with China continued after 1386 (Murray 1926: 237, 239). A Japanese team in 1991 found Chinese and Thai ceramics representing a date range from the 12th to the 15th centuries: most were from the 14-15th centuries (Kawatoko 1993).

The site at Suwākin al-Qadīm has not yet yielded a confirmed harbour, although Murray identified a small silted bay in the centre of the site (see Figure 5.15). Satellite imagery suggesting the lack of a sheltered harbour at the site, and continuous coral reefs offshore, have prompted Peacock and Peacock (2007) to propose that the main harbour of 'Ayhdhāb's international trade may have located at Halayb, 20km to the south. Testing of that hypothesis requires investigation on the ground.

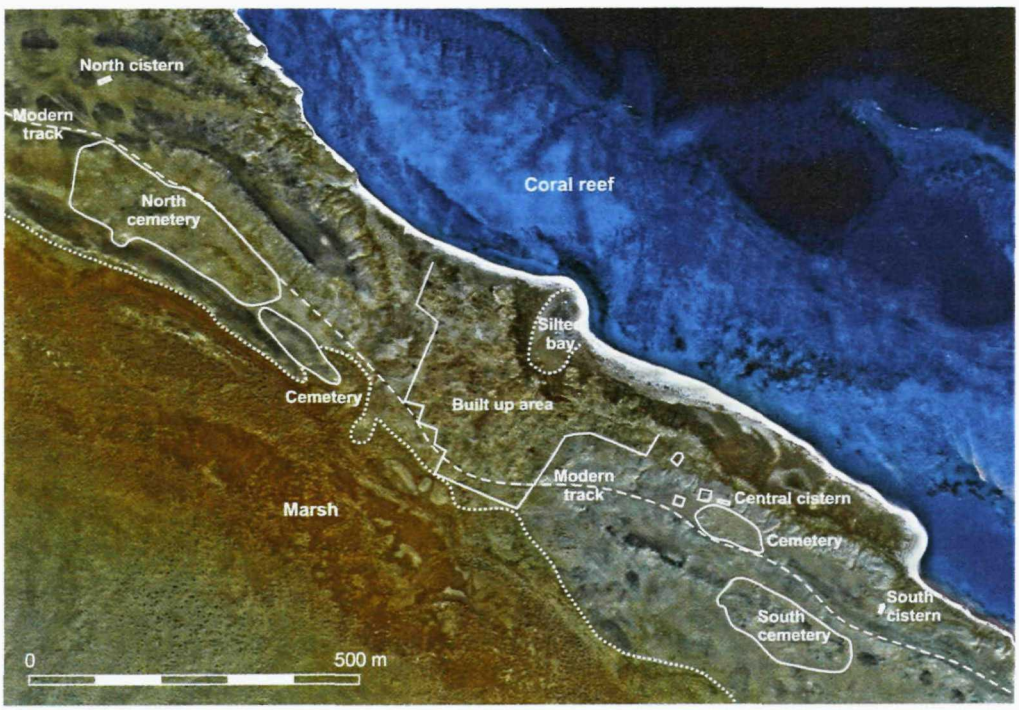

Figure 5.15: The site of 'Aydhab, showing principle features (Peacock and Peacock 2007: 38)

There is no explicit contemporary mention of 'Aydhāb in the historical record before the mid-ninth century, after which it is cited frequently until its apparent demise in the 14th century. The 12th Century Jacobite Arab Synaxarium refers to the appointment of Nabīs as bishop of 'Aydhāb, probably in the late fourth or early fifth centuries, but this may be a subsequent insertion, replacing the defunct toponym Berenike (Atiya 1991: 6.1769).

The historical data for the seventh and eighth centuries is so sparse that little light can be shed on the traffic, if any, passing between the Nile and the Red Sea during this time. What is recorded is a pact reached with Nubia by 'Abd Allāh bin Sa'd ibn Abī Sarḥ, the Muslim conqueror of Upper Egypt, in 31 AH (652) (Ibn 'Abd al-Ḥakam, *Futūḥ*: 169-70). Following this pact, Aswan was established as the chief garrison town of Upper Egypt (Guest 1908: 11, Ibn 'Abd al-Ḥakam, *Futūḥ*: 173). The resulting pre-eminence of Aswan was to determine the route to the Red Sea coast, and ultimately 'Aydhāb, until Qūṣ was established as the capital of southern Upper Egypt in 11th century (Garcin 1995: 864). According to Ibn Ḥawqal (*Ṣūrat*: 50), Ibn Abī Sarḥ conquered Aswan having "crossed there from the Ḥijāz" – although this contradicts Ibn 'Abd al-Ḥakam's account that Muslim forces arrived from the north. The various desert routes between 'Aydhab and the Nile are shown in Figure 4.8 and Figure 5.16.

That Muslims were moving through the Eastern Desert by the early eighth century is indicated by a new Muslim-Beja pact reported by Ibn 'Abd al-Ḥakam (*Futūḥ*: 189). This required the Beja to provide tribute, and to leave Muslims and their subjects unmolested in Beja territory. The existence of the pact implies preceding tensions, and hints at Beja resistance to the Muslim presence in the region. Al-'Uswānī (968-73) says that, following the 725 pact, "the Muslims proliferated in the region of the mines, mixing and marrying with [the Beja]. Many of the [Beja] people known as al-Ḥadārib adopted a weak Islam" (in al-Maqrizi, *Khiṭaṭ*, 1.530).

However it is not until the ninth century that there is an explicit report of Muslims seeking to travel to the Red Sea from the Upper Egyptian Nile. Ibn Ḥawqal (*Ṣūrat*: 52) describes a confrontation in 819-20 (204 AH) between a group of Beja and a caravan of Muslim pilgrims from Qift hoping to travel to Makkah through "the Banī Ḥaddān islands, on the Ṭalafah route." According to Ibn Ḥawqal, the pilgrims died of thirst. A Muslim military response in 827 was led by Ḥasan Nābighī, who made his base for three years at "a place now called Mā' Ḥakam, a days journey from 'Aydhāb, and four from al-'Allāqī." Whether this reference to 'Aydhāb is an indicator that the port already existed is unclear: Ibn Ḥawqal could simply be locating Mā' Ḥakam for the contemporary reader.

The Nābighī offensive was the first of three Muslim military actions against the Beja in the early-mid ninth century which were ultimately to transform the nature of Muslim involvement in the region, and which established 'Aydhāb as a significant Muslim port. An offensive led by 'Abdallāh bin al-Jahm apparently secured the capitulation of the Beja ruler Kanūn ibn 'Abdul-Azīz in 831 (al-Uswānī, in al-Maqrīzī, *Khiṭaṭ*: 1.531-3). The resulting pact twice makes reference the rights of Muslims and their *Dhimmī* clients travelling "by land or sea". Sea travel is also implied in a clause protecting Hajj pilgrims.

However, the pact also suggests that the Muslims did not yet have a significant presence at 'Aydhāb. It specifies that the Beja do not interfere with a palace called Qabān on the Nubian border, yet no such terms are set for Muslim properties at 'Aydhāb. Moreover, the pact requires the Beja to respect two existing mosques in their territory, at Ṣanjah and Ḥajar, but it does not mention a mosque at 'Aydhāb, which surely there would have been were it already a major Muslim port of trade, let alone pilgrimage.

Whether or not 'Aydhāb existed before the 831 pact, it emerges into the historical record following the agreement's collapse during the Caliphate of al-Mutawakkil (847-61), when the Beja are reported to have resumed raiding, withheld payment of *kharāj* tax, and violently asserted ownership over the gold mines of the Eastern Desert (al-'Uswānī, in al-Maqrīzī, *Khiṭaṭ*: 1.533; al-Ṭabarī, *Tārīkh*: 3.3.1429). Al-Ṭabarī says that the Sultan received one fifth of the mines' output.

The result of this breakdown in Muslim-Beja relations was a new military campaign led by Muḥammad bin 'Abd Allāh al-Qummī. His tactics, according to al-Uswānī, involved a land assault of 20,000 troops, supported by seven supply ships carrying food and weapons from al-Qulzum (in al-Maqrīzī, *Khiṭaṭ*: 1.534): a regional port must have been used. The outcome was a new settlement with the Beja in 241 AH (855-6). Al-Ṭabarī (*Tārīkh*: 3.3.1433) says this secured "the route from Egypt [Misr] to Makkah".

The first historical mention of the toponym 'Aydhāb comes soon after this new pact. Al-Ya'qūbī describes it already as the port "from which people sail to Makkah, the Hijāz and Yemen, and to which merchants come, carrying gold, ivory and suchlike in boats." (*Buldān*: 335)

This mention of gold is indicative of a close functional connection between 'Aydhāb and the Eastern Desert mines at this time. An influx of Muslims in the decade following the pact of 855-6 precipitated an upturn in gold production: "People heard of it and came from all lands," says al-Uswānī (in al-Maqrīzī, *Khiṭaṭ*: 1.534). Among them were the Arab tribes of Rabī'ah and al-Juhaynah, accompanying their military leader, Abū 'Abd al-Rahman

'Abd Allah bin 'Abd al- Ḥamd al-'Umrī, following their Nubian campaigns of 868-9. The settlement process thus doubled as military presence. Both al-Mas'ūdī (*Murūj*: 3.33) and al-Uswānī (in al-Maqrīzī, *Khiṭaṭ*: 1.534) say that intermarriage with the Beja extended the pacifying effect of the colonisation. Al-Ya'qūbi (*Buldān*: 333-5) says that the Rabī'ah Arabs came to form the majority community of al-'Allāqi, which he says was "... like a great city ... The Rabī'ah were at the Ki[...]ār[4] gold mine. The Juhaynah, from Yemen, and an Arab tribe called the Balayyah had settled at the Raḥm mine among "other diverse peoples."

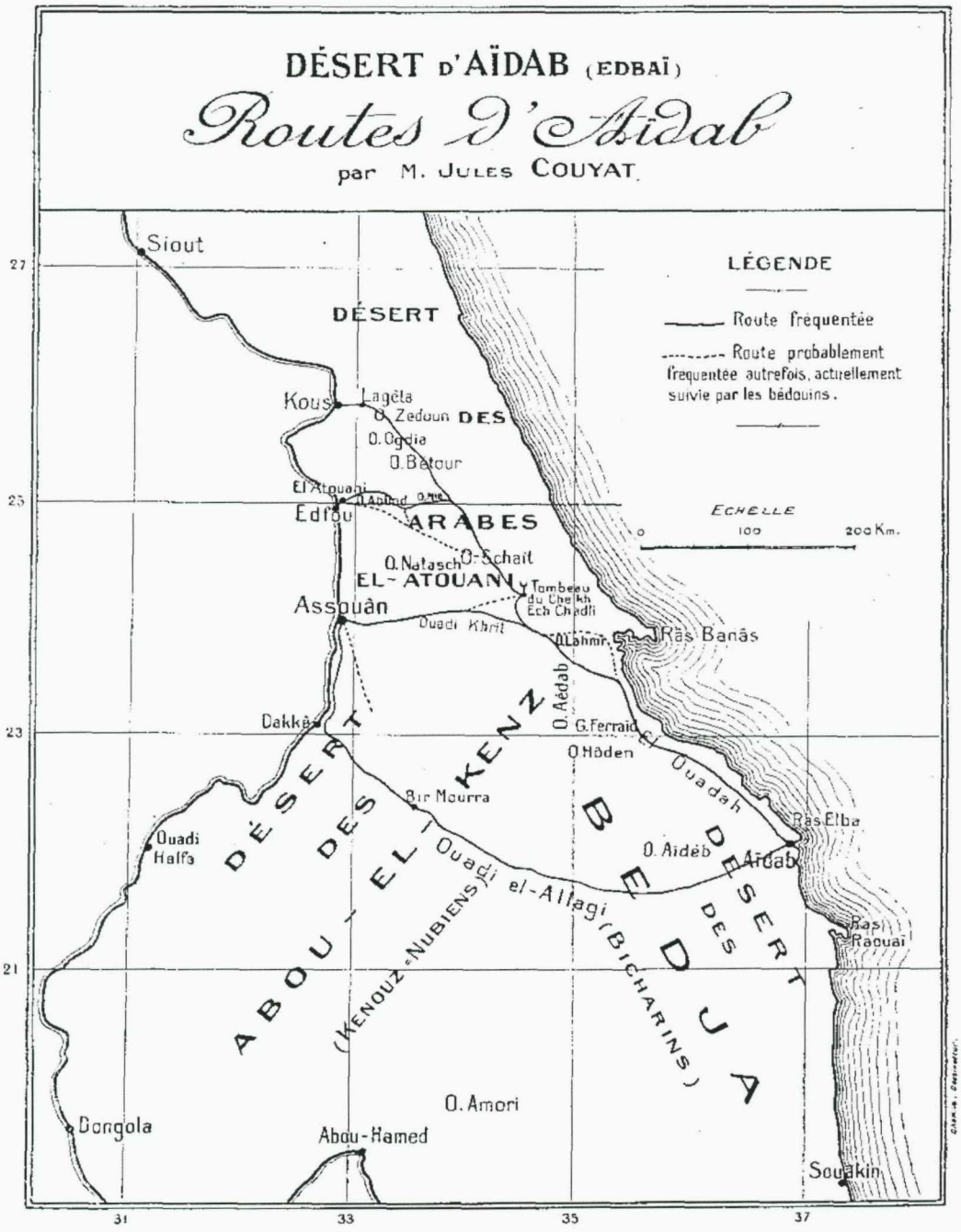

Figure 5.16: The desert routes to 'Aydhāb from Qūs, Idfū and Aswan (Couyat 1911)

[4] The surving text has no diacritic to indicate the central radical: it could be *b*, *t*, *th*, *n* or *y*.

The degree of Arab settlement of the mines region in the ninth century was such, al-Maqrīzī says, that some 60,000 camels were used to bring provisions from 'Uswān. 'Aydhāb was also part of the supply process: he says the caravans were supplemented by *jilāb* [sailing vessels] bringing supplies to the port from al-Qulzum (*Khiṭaṭ*: 1.534).

By the tenth century, 'Aydhāb is described as a fort [*ḥiṣn*] reached from Aswan by way of the mines (Ibn Ḥawqal, *Ṣūrat*: 35-6; Iṣṭakhrī, *Masālik*: 50). It thus emerges from the pre-Fatimid histories of Egypt as an entry point for Muslim military and colonial control over the Eastern Desert and its mines. Moreover, the route to the Ḥijāz through the port had been opened to pilgrimage and trade, and contact had been established at least as far as Yemen. Whether trade was already under way with India, as Ibn Khurdhādbeh says it was by this time from al-Qulzum, is not clear. 'Aydhāb was also an export port for at least some of the gold produced in the mines: it was presumably bound for the Abbasid capital in Baghdād. Al-Ya'qūbī's mention (*Buldān*: 335) of an ivory trade through the port in the ninth century may well also indicate exports: elephant were to be found wild between Aswān and 'Aydhāb (al-Maqrīzī, *Khiṭaṭ*: 1.529; al-Bakrī, *Mamālik*: 3.3.730r)

'Aydhāb's connection with Arabia was an important one from the outset. Al-Maqrīzī says that the scribe who wrote down the Muslim-Beja pact of 831 was "of the residents of Jiddah" (*Khiṭaṭ*: 1.533). The Rabī'ah Arabs were originally from the al-Yamāmah region of western Arabia (al-Ya'qūbī, *Buldān*: 334). They and the Yemeni Juhaynah surely maintained contact with kinsfolk across the sea. The "land of mines" opposite Arabia did not escape citation by al-Hamdānī in his geography of the Arabian peninsula (*Mukhtaṣar*: 3.1.570r), and Ibn Ḥawqal says that fine linen and headscarves produced in Upper Egypt were traded to the Ḥijāz (*Ṣūrat*: 109). Such trans-Red Sea contact was a function of the new ethnic constitution of the Eastern Desert that was a direct result of the Islamic conquest.

A more substantial transformation brought about by Islam was the potential for a southern Egyptian port to carry Hajj pilgrims to Makkah. Although the historical data show the crossing to Makkah, through Jiddah, was already being made in the 8th century, the first direction of mention of 'Aydhāb as a pilgrimage port is by al-Muqaddasī in the tenth century (*Aḥsan*: 78). However, it was between the 11th-13th centuries that the port became a major pilgrimage hub. Al-Zamakhsharī says that ships from 'Aydhāb were also to be seen at al-Jār, the port of al-Madīnah (*Jibāl*: 3.3.797r)

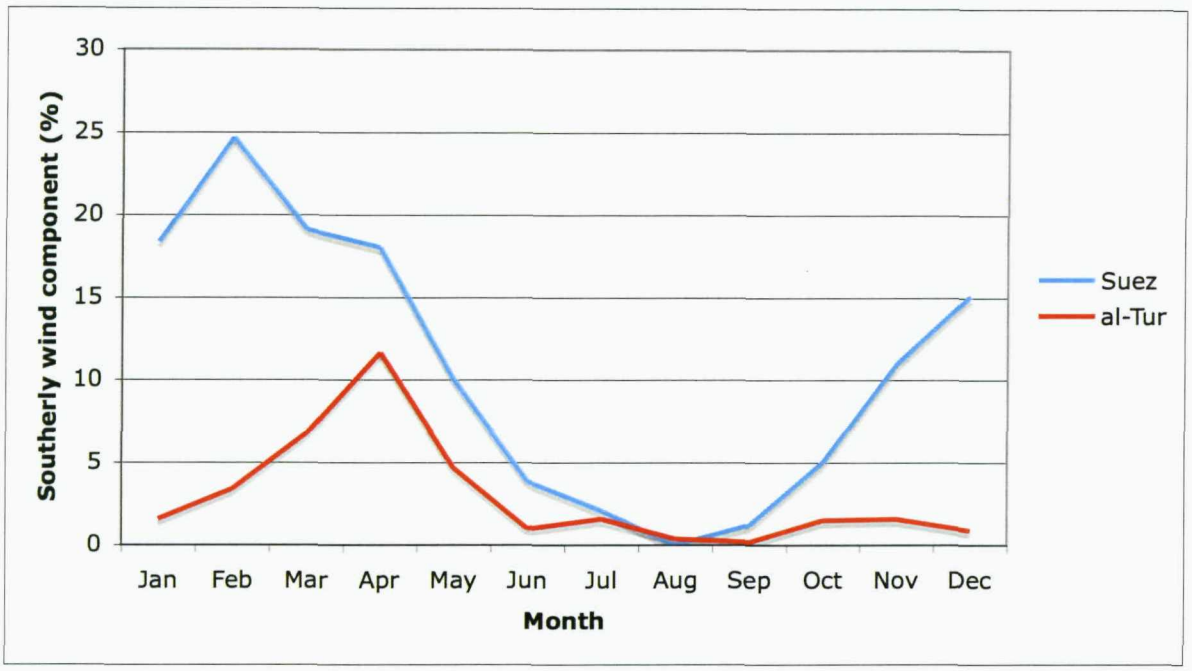

Figure 5.17: Percentage of northerly winds blowing at the Gulf of Suez ports of Suez and al-Ṭūr, by month (Ministry of Public Works 1922: 15, 29).

Before the 11th century, the historical texts are unanimous that the route to 'Aydhāb was from Aswan, capital of Upper Egypt. While the status of Aswan as regional capital was part of the reason for the prominence of the Aswan-to-'Aydhāb route in the early centuries of Islam, another reason was the existence of the gold mines. The earliest description of the Aswan-to-'Aydhāb route, in al-Ya'qūbī, appears in a section itself entitled "The gold mines". What follows is al-Ya'qūbī's relatively detailed description of the route to various Eastern Desert mines, including 'the great city" of al-'Allāqī: 'Aydhāb is mentioned as the port, four stages on from al-'Allāqī, from which Muslims sail to Makkah (*Buldān*: 335). Maintaining a single major route through the Eastern Desert, incorporating both the gold mines and 'Aydhāb, with the garrison town of Aswan at the end of it and a fort at the port, was a militarily effective means of policing the region.

The development of 'Aydhāb into Egypt's premier Red Sea port of international trade and pilgrimage followed the anti-Fatimid rebellions that took place in the late 11th century under the Caliph al-Mustanṣir Billah (1036-94). Al-Maqrīzī says that the Egyptian pilgrimage caravan to Makkah, which since the conquest had gone by land via al-Qulzum and Aylah, was halted around 1058 and did not resume for over two hundred years. During this time, he says, the only route for pilgrims was by sea through 'Aydhāb (*Khiṭaṭ*: 1.549-50). Following the anti-Fatimid rebellions, Fatimid control over the Nile valley was reasserted: Qūṣ was established as the capital of upper Upper Egypt, and with it the Qūṣ-to-'Aydhāb pilgrimage route became the principle Red Sea route for traders.

The halt in the land pilgrimage, which had begun amid political crisis, was continued by famine. In addition, in 1116, the Crusader Kingdom of Jerusalem seized Aylah ('Aqabah)

at the northern tip of the Gulf of 'Aqabah, and held it until Ṣalāh al-Dīn recaptured it in 1171. It was briefly held again by the Crusader from 1182-83. Thereafter, apart from its brief capture by Raynald de Châtillon (Glidden 1960: 783-4), Aylah was in Muslim hands. However, it was not until al-Ḍhāhir Baybars seized Makkah in 1269 from the Emirs of Makkah that the land route for African pilgrims was re-established.

According to al-Maqrīzī (*Khiṭaṭ*: 1.549), pilgrims bound for 'Aydhāb boarded boats at al-Fustāt and travelled to Qūṣ, from where they crossed the desert to the port. When al-Idrīsī describes 'Aydhāb in the 1154, he calls it the Hajj port "of Maghribi pilgrims". He says that the revenues of the port, including levies on pilgrims, were split evenly between the Beja and Egyptian authorities (*Nuzhat*: 2.135). Ibn Jubayr, passing through the port in 1183, soon after the end of Fatimid rule, claims that Salāh al-Dīn had abolished a pilgrim tax imposed under the Fatimids (*Riḥlah*: 56)

The sea crossing to Jiddah was not comfortable. Ibn Jubayr (*Riḥlah*: 71-5) complains that pilgrims were loaded onto the *jilab* "like chickens crammed in a coop", and that a common saying among the cynical *jilab* owners was: "We mind the planking, you mind your souls". His own journey took a week, due first to a storm and then to strong winds that prevented them from entering Jiddah. Pilgrims making the return journey often found their vessels driven by northerly winds to the coast south of 'Aydhāb, where they were at the mercy of local desert dwellers. "There are those whom the wind helps to reach the anchorage of 'Aydhāb, but they are few," he says (*Riḥlah*: 70). Indeed, Ibn Baṭūṭah was one of those blown off course (*Tuḥfat*: 2.251)

'Aydhāb's status as Hajj port was being challenged even before the re-opening of the land route to Makkah. The port of al-Quṣayr to the north (see Figure 5.1) emerges into the historical record during the 'Ayyubid period. Its first mention is by Ibn Sa'īd (before 1286), who describes it already as "the famous entrepot of Qūṣ" (*Untitled*: 4.1.1085r). Further south, beyond Egypt's borders, Sawākin also grew as a competitor to 'Aydhāb (Ibn Baṭūṭah, *Tuḥfat*: 2.161-2).

The growth of 'Aydhāb as a Hajj port is paralleled in the historical data by its growth as a commercial port. Al-Iṣṭakhrī and al-Ya'qūbi had indicated that trade was taking place with Yemen and East Africa in the ninth century. Nasir i Khusraw, passing through in 1050 says it was by then a port "for ships coming from Abyssinia, Zanzibar and Yemen" (*Safarnama*: 65). By the 12th-century, more distant destinations are mentioned. The *Kitāb al-Istibṣār* (3.4.908v) says that from 'Aydhāb one "travels to the lands of Yemen and India and other such countries".

Ibn Jubayr marvels at the scale of the trade passing through 'Aydhāb, which he describes as:

> "...One of the most frequented ports in the world, because of the ships of Yemen and India that sail to and from it, and the pilgrim ships that come and go (*Riḥlah*: 69).

He writes that the camel caravans serving 'Aydhāb were innumerable. "Most of what we saw was loads of pepper" in quantities such that "... it seemed to us to equal the dust." He continues:

> "In this desert, on the roadside, you come across loads of pepper, cinnamon and such goods that have been left unguarded by the side of the road because a camel has fallen ill, or some other problem. They remain there until their owner picks them up, safe from danger despite all the people of diverse sorts that pass by." (*Riḥlah*: 67-8).

Such a situation suggests extensive state investment in the security of the route at this time.

Al-Maqrīzī says that 'Aydhāb continued as an important port in the Yemen-India trade for almost a century after its decline as a Ḥajj port (*Khiṭaṭ*: 1.550-1). He claims that it was one of the greatest ports of the world until 1358-9, after which time the merchant vessels of Yemen and India stopped coming, and Aden and Jiddah and al-Tūr came instead to dominate the trade. Competition from al-Quṣayr for the Yemen trade was already in place by the time Abū al-Fidā was writing around 1321. He says that: "Qūṣ ... is the entrepot of the traders from Aden. The entrepot of Qūṣ is al-Quṣayr" (*Taqwīm*: 111).

It appears that the change in the main Nile port serving 'Aydhāb from Aswan to Qūṣ coincided with the transfer of the capital of upper Upper Egypt from the former to the latter in the late 11th century. As late as 1067, al-Bakrī (*Mamālik*: 3.3.730r) describes 'Aydhāb as being reached from Aswan. In 1154, after Qūṣ had become regional capital, al-Idrīsī says that 'Aydhāb was served from there (*Nuzhat*: 2.134). Thereafter, Qūṣ is consistently reported as the Nile entrepot of 'Aydhāb. It is this route that Ibn Jubayr took in 1183. Al-Yāqūt (*Mu'jam*: 3.751) implies the same route when he describes 'Aydhāb as "anchorage of the boats that come from Aden to Upper Egypt" and Qūṣ as "the waystation [*maḥaṭṭ*] for merchants coming from Aden". As late as the 15th century, al-Qalqashandī (*Ṣubḥ*: 1.244) describes 'Aydhāb as "the port of Qūṣ". However Ibn Sa'īd, in the late-13th century, writes that a route from Aswan still existed, meeting the road from Qūṣ at a place called al-Waḍaḥ (*Untitled*: 4.1.1084v). Meanwhile, Ibn Baṭūṭah (*Tuḥfat*: 1.109) departed

for 'Aydhāb from Idfū in 1326, joining the Qūṣ-to-'Aydhāb route at Sammout, not far from its origin (Couyat 1911: 140). Alternative routes were, therefore, possible.

Just as the location of the main entrepôt of the Red sea trade in Upper Egypt was decided in part by domestic Egyptian political and administrative changes, so too Muslim access to the port of 'Aydhāb depended on diplomatic and military relations with the Beja peoples. This was clearly true during the initial Muslim penetration of the region before the ninth century, but access to 'Aydhāb was throughout the history of the port dependent on a combination of Egyptian-Muslim political will, military might, and a readiness to make accommodations with the Beja.

Throughout the period of 'Aydhāb's function, the Arabic authors regard the port as being at the periphery of Egyptian control. In the 14th century, Abū al-Fidā' observes that:

> "Some put the boundary of Egypt at a point that includes 'Aydhāb within it, that being the best representation. Others put it in the land of the Beja and others in the land of the Abyssinians." (*Taqwīm*: 121)

Even after al-Qummī's apparently decisive victory over the Beja in 855-6, Muslim control over the Eastern Desert soon went into abeyance. Ibn Ḥawqal says that thereafter:

> "...the power of the Sultan ceased in al-'Allāqī, al-Mutwakkil died, and the Beja took control of their [own] marches." (*Ṣūrat*: 33)

Ibn Ḥawqal and Iṣṭakhrī reflect this liminal status of Aydhāb in their texts, saying that the Beja lands bordered Abyssinia, Nubia and Egypt, "ending at the gold mines". Al-Hamdānī groups 'Aydhāb with the more southerly ports of Nādi' and Sawākin in "the lands of central Abyssinia" rather than Egypt (*Ṣūrat*: 35-6; *Masālik*: 30; *Mukhtaṣar*: 41). Al-Mas'ūdī says that al-'Allāqī and 'Aydhāb are equally "of Upper Egypt and the Beja", and that the goldmines are "in their [i.e. the Beja's] land" (*Murūj*: 1.238). Suitable to this marginal position, Iṣṭakhrī (*Masālik*: 35) and Birūnī (*Jamāhīr*: 242), describe 'Aydhāb as being fortified.

In the 11th century, the visiting Nasir i Khusraw believed that 'Aydhāb "belongs to the Sultan of Egypt and is a customs station" (Safarnama: 65). However, if this was true in the 11th century, it appears not to have been in the 12th. Al-Idrīsī then says that the Beja and Egyptian rulers each had a resident agent at 'Aydhāb, and that these divided revenues equally between them. The Egyptians provided supplies and food, and the Beja defence from "the Abyssinians" (*Nuzhat*: 2.134-5). Ibn Baṭūṭah (*Tuḥfat*: 1.110), writing some time after his visit in 1348, recalls the split as 2:1 in favour of the Beja.

The historical data on the decline of 'Aydhāb has been considered in detail by Hikoichi (1989: 167-72). Her conclusion is that Egypt's Mamluk government began to lose control of the port, and more importantly the desert route to it, in the early 14th century, but that the Karīmī merchants continued to pass through until later in that century. Thereafter, 'Aydhāb remained a *thughr*, and was used, *inter alia*, by Venetians seeking contact with Ethiopia. However, its heyday had passed. Following the arrival of the Portuguese in the Indian Ocean in 1498, European maps do not mention it: instead, Marsā Jadīd ('new port') is marked. That site still exists, further to the north of the ruins of 'Aydhāb. Following 'Aydhāb's decline, the main route of international trade followed the eastern shore of the Red Sea, connecting Aden, Jiddah, and al-Tūr – all of which were under Mamluk control. Meanwhile al-Quṣayr began to emerge into the historical accounts again.

The cause of the loss of 'Aydhāb, Hikoichi argues, was Beja rebellion. Certainly, Ibn Baṭūṭah had to turn back from 'Aydhāb on his way to Makkah in 1326 because of fighting between Mamluks and the Beja. When he returned in 1348, the port was open once again (*Tuḥfat*: 2.251). However, it may also be the case that the Beja rebellions were a function of diminishing Mamluk interest in the route when others, perhaps less costly in terms of military and financial investment, were open to it. While the Mamluks had the option of accessing the eastern shore of the Red Sea, the Fatimids before them had not: their only option in accessing the Red Sea was to secure a route from the Nile. Al-Qulzum was perhaps seen as too vulnerable to attack from the east, particularly by the Crusader kingdoms. While Muslim texts often speak of *conquest* of the Beja, and their obligation to pay tribute, the truth is probably more that Muslim access to the routes through the Eastern Desert to the Red Sea required a combination of concession and coercion.

al-Quṣayr

The Roman port of Myos Hormos at the site of medieval al-Quṣayr had been abandoned in the early third century, following the silting-up of the harbour there. Archaeological investigations at the site have also identified the site of the Islamic harbour, with finds dating occupation tentatively from the late Ayyubid period (Rebecca Bridgeman, pers. comm.), and more clearly from the Mamluk period to the 16th century, after which the harbour shifted from what is now known as Quṣayr al-Qadīm to modern al-Quṣayr (Blue 2007: 265-6; Blue and Peacock 2006: 95-115). The historical sources suggest an Ayyubid date for the emergence of the port: the first to mention it unambiguously is Yāqūt (*Buldān*: 4.126), who puts it five days distance from Qūṣ. Therafter, a number of late 13th-early 15th century authors describe al-Quṣayr simply as the 'port of Qūṣ' (Abū al-Fidā, *Taqwīm*: 2.28; Ibn Sa'īd, *Untitled*: 4.1.1085v; al-Nuwayrī, *Nihāyat*: 1.243; Ibn Duqmāq, *Intiṣār*:

5.42). Al-Qalqashandī relates that al-Quṣayr was the port through which the Karīmī merchants of Yemen traded goods into Egypt, taking goods thence to Qūṣ and to warehouses in al-Fusṭāṭ (*Ṣubḥ*: 3.465). Thus it appears that al-Quṣayr re-emerged as a Red Sea port in the late-Ayyubid period, and function for a time alongside 'Aydhāb, before taking over from the latter as the principle port of the Egyptian Red Sea in the late 14th century. Might the re-emergence of al-Quṣayr be seen as a Mamluk attempt to secure a less troublesome route to the sea?

Summary: Medieval change in the Nile-Red Sea connections

The Islamic period up to the 15th century presents a case study in which the locations of Egypt's principal Red Sea ports seem to cover every possible permutation of north-south navigation using the Nile and/or Red Sea. Immediately following the conquest, Egypt's major Red Sea port was at al-Qulzum, at the northern extreme of the Gulf of Suez. The Nile valley, it seems, was bypassed by international commerce. By the 11th century, however, the focus of activity has passed some 930km down the coast to 'Aydhāb, at the opposite extreme of Egypt's political reach. Before that date, 'Aydhāb had largely been reached by way of Aswan. After it, the stepping-off point on the Nile was Qūṣ. Then, by the late 14th century, 'Aydhāb too was abandoned, and al-Quṣayr emerged as the new 'solution' to connecting Nile and Red Sea: neither too far north in the Red Sea, nor too far south, it is half-way between al-Qulzum and 'Aydhāb. It is neither three days from the Nile as al-Qulzum is, nor three weeks from it, as 'Aydhāb. It is a journey of seven days. In sum, it appears to hedge the relative risks and rewards of river, sea and land travel.

In terms of journey times, 'Aydhāb was, on the basis of the journeys considered in Section 3, some 40 days from Cairo via Aswan going upstream, and about 46 heading downstream – probably more for a merchant vessel, and perhaps a little quicker when the north winds were at their peak during the flood.

Joining and leaving the river instead at Qūṣ, the journey time to and from 'Aydhāb was almost the same on the way upriver, and, despite the longer land journey, about 36 days going downstream – again, longer for merchant vessels, and a little faster during flood. The time advantage in making the land-river switch at Qūṣ rather than Aswan lies in the nature of the river conditions between the two, discussed in Section 4.3: heading upstream from Qūṣ often required substantial towing at least until Isnā, because of the weak winds relative to the current velocity. On the way downstream, the strong northerlies south of Isnā slowed the journey downstream. Neither were insurmountable obstacles, however – they simply affected journey times.

The land-river connection between al-Quṣayr and Cairo was considerably quicker. The total journey upstream would have taken about 26 days – two weeks quicker than the journey to 'Aydhāb. Downstream, it would have taken 21 days – again, two weeks quicker than the Cairo-Qūṣ-'Aydhāb route.

From al-Qulzum, transfer by land to the Nile normally took three days – or about five days on the Nile-Red Sea canal, in the seasons and eras when it was open. For people and goods transiting from al-Qulzum to the Mediterranean, the journey was also three days. Meanwhile, goods and people arriving in Cairo from either 'Aydhāb or al-Quṣayr were still, typically, up to five days from the Mediterranean.

Setting aside for a moment journey times on the Red Sea itself, let us consider the land-and-river components of these journeys. If speed of journey were the deciding factor, then, on the land and river sections of the routes considered, al-Quṣayr appears to have an advantage of some two weeks over 'Aydhāb. For vessels travelling to and from Cairo/Fusṭāṭ, al-Qulzum has a further advantage of about three weeks over al-Quṣayr on the outward journey, and about 18 days inbound. If an onward connection to the Mediterranean was required, then al-Qulzum's advantage was increased by another two days (see Figure 4.7 and Figure 4.8).

Of course, unbroken journey time is not the only environmental factor influencing choice of route. We have seen in the previous chapter that vessels departing Egypt for the southern Red Sea and beyond would have done so in late March or early April. That was also a feasible time for sailing on the Nile for small or medium-sized boats – but not the largest cargo vessels. The problem of grounding would have been on the increase, and northerly winds were not nearly as prevalent as during August-October, requiring frequent towing. On the outward journey, therefore, al-Qulzum seems an eminently superior choice: far better to transfer goods and people by land to the head of the Gulf of Suez – just three days from either the Mediterranean or Cairo/al-Fusṭāṭ – and let the reliable northerly winds of the Red Sea do the rest. Effort would be reduced, speed increased.

On the inbound journey, al-Qulzum's advantage is clearly diminished by the problem of northerly winds in the northern sector of the Red Sea. However, we have seen that the port has an 18-day advantage over al-Quṣayr on the landward/Nile side, and an advantage of almost five weeks over 'Aydhāb. Would it take as long as five weeks to sail on the Red Sea to al-Qulzum from the level of 'Aydhāb, or 18 days from al-Quṣayr? Whitewright (2007: 85) has calculated that ancient vessels beating against the northerly wind could expect to achieve a velocity-made-good of around 1.9 knots. That equates to an unbroken journey time of about ten days from the latitude of 'Aydhāb to al-Qulzum, and less than a

week from al-Quṣayr. Given that the inbound journey was made between April and July, inbound navigators could, moreover, reasonably hope to catch at least some southerly winds, especially in April and early May (see Figure 5.17). Thus, even on the inbound journey, and even assuming unrelentingly contrary winds, al-Qulzum appears to maintain its advantage over the southern ports. Add to that the fact that cargoes arriving at the southerly Red Sea ports might have to wait some weeks at Qūṣ or Aswan for the rise of the Nile, and al-Qulzum begins to emerge, not just as a viable Red Sea port for Egypt, but perhaps even a superior one.

And yet this (or indeed any) analysis of the relative navigational merits of the Red Sea ports of medieval Egypt clearly does not explain the chronology established above. Al-Qulzum was not the Red Sea port *par excellence* throughout medieval Egyptian history. It was abandoned in the Fatimid period in favour of 'Aydhāb, thus inverting the river-versus-Red Sea navigational calculus. Later, 'Aydhāb gave way to al-Quṣayr, which in turn yielded to the Aden-Jiddah-al-Tur route for trade conducted through the Red Sea. Clearly, whichever of these routes was navigationally the most efficient, it was not always the one that was favoured or used.

5.5 Conclusion

This section of the thesis has looked at the major ports of the Egyptian periphery, and considered the evidence for their port functions and chronological durations. It has taken three regions as case studies – the Red Sea ports, the eastern Delta ports, and western Delta ports. In all of these cases, the location and chronologies of the ports in question has been determined not entirely by the navigational and transportational logistics of the sites in question. Instead, the 'rise and fall' of these ports has been the function of a more complex interplay of the needs of the navigator with the capacities, ambitions and limitations of the state. Thus, the routes through the desert to the Red Sea ports of al-Qulzum, 'Aydhāb and al-Qusayr depended on the capacity and wherewithal of the state to secure the routes for mercantile traffic. The route to 'Aydhāb through the Beja lands became a possible, indeed obligatory, route for merchants because the state, particularly in the Fatimid era, secured that route by force and negotiation with the Beja peoples. In turn, the authorities became obliged to make the military exertions and political and economic concessions necessary to secure that route because the alternative route to the Ḥijāz – by land through Sinai – had become blocked. The Red Sea merchant vessels that used 'Aydhāb, and later al-Quṣayr, enjoyed the (apparent) navigational benefits of sailing to and from a more southerly Egyptian port only because the *geopolitical* situation in which they operated made that possible. They also used 'Aydhāb in the Fatimid era because the political and economic

centre of the region had become established at Cairo, and because it was there that the new, highly centralised Fatimid – and later a Ayyubid and Mamluk – authorities had their seat, and it was through there that those authorities desired that trade be channelled in order that luxury goods found their way to the capital, and in order that they could be controlled and taxed *en route*. The relative merits of sailing in the northern Red Sea versus the Nile valley were entirely subordinated to these top-down prerogatives.

In the eastern Delta, al-Faramā fell victim first to hydrology – with the loss of its Nile branch – and then to the same geopolitical changes that had drawn east-west trade from al-Qulzum to 'Aydhāb. The Isthmus of Suez route, bypassing the political and economic capital at Cairo, was no longer acceptable to the political centre – nor, by extension, economically interesting to merchants seeking out prestige markets. Again, what determined whether goods passed up the Red Sea and across the Isthmus to al-Faramā (and vice-versa), or up the Nile valley to Cairo, and thence to Alexandria (and vice-versa) was not the choice of navigators seeking the optimal route, but the routes determined by the central political authorities in pursuit of their own fiscal, economic and military interests. Tinnīs was a navigationally excellent replacement for al-Faramā – it was certainly, in navigational terms, vastly superior to nearby Dumyāṭ. However, its navigational superiority was only accessed as long as Fatimid and Ayyubid naval strength and strategy maintained the defense of Tinnīs. What determined the demise of Tinnīs was not a reshaping of the physical environment, as had been the case with al-Faramā, but a change in the military prerogatives of the Ayyubid government.

In the western Delta, an excellent seaport – Alexandria – found itself increasingly separated from the natural waterways of the Nile as the Canopic branch dwindled. Although still connected to Nile via the sea and the Rashīd mouth, that connection was dangerous. Besides, if Alexandria was to be supported as an inhabited port, it needed to be supplied with potable water. The solution was the Alexandria canal, in its various incarnations. State support for this route, and indeed for the al-Ḥāfir canal, meant that vessels could connect between al-Fusṭāṭ/Cairo and Alexandria without venturing into the sea. Again, the role of the central authorities is vital in enabling and determining route. It was only because of the concerted efforts of the state – especially from the Tulunid period onwards, when power had devolved down to the Egyptian level – that this relatively safe route to and from Alexandria was possible. It is worth noting that it was once the centre of power had again shifted out of Egypt during the Ottoman period that the Alexandria canal fell into disrepair, and trade routes, by land or sea, shifted to Rashīd.

6. Conclusion

This thesis has sought to appreciate something of the processes and practices of navigation – particularly over long-distance routes – on the Egyptian Nile in the medieval Islamic period. In doing so, it has pursued three objectives. First, it has attempted to identify, locate and give a chronological dating to the major waterways of Egypt from the time of the Islamic conquest in the seventh century to the late Mamluk period in the 15th. To this end, it has drawn in the first instance on the medieval Arabic literary canon of geographies, histories and other texts, in addition to historical cartography and modern geological studies. The resulting interpretation is summarised in the maps presented in Appendix 2, Figures 6-19, and in the ESRI ArcGIS file on the DVD disk accompanying this thesis. Second, the thesis has sought to develop an understanding of the navigational experience of the Egyptian Nile – an area that has been surprisingly neglected to date. For this is has depended on hydrological and meteorological data on the Nile, as well as the numerous first-person traveller accounts of sailing on the river dating from a much broader period than that which forms the focus of this study. Finally the thesis has identified a selection of major river ports and river-related seaports of medieval Egypt, and has sought to establish their functions and chronologies of usage, as well as their navigational place within the wider river network. In doing so it has identified a divergence between the placement of those ports in terms of their relative navigational advantage and their place within a wider geo-political and economic context.

Attempts to 'reconstruct' the routes of the major Nile waterways of medieval Egypt using textual accounts have been made prior this thesis. In particular, Toussoun (1925) has executed an encyclopaedic account of the waterways of pre-Islamic and Islamic Egypt, and Guest (1912) has sought to plot the al-Idrīsī's account of the Nile by correlating place-names mentioned by al-Idrīsī's with modern place names, while at the same time making partial reference to Ibn Ḥawqal in order to support his interpretation of al-Idrīsī. Meanwhile Ball (1942) and du Bois Ayme (1813) have offered interpretations of the much more sparse Greco-Roman accounts of the Nile. In part, Section 3 of this thesis was a re-examination of the data and of the conclusions drawn by these earlier interpreters. This thesis does not seek to criticise the work of deceased scholars upon whom, in any case, it has drawn upon in its interpretation of the medieval Nile. Rather, it acknowledges Ball's comment (1942: 24) that "there is ... room for differences of opinion", and notes Guest's observation (1912: 941) that "if a representation of the country is to be obtained that will give a satisfactory idea of its past character, it will have to be built up bit by bit." The

interpretation presented here pretends to be neither the only valid opinion, nor the last word.

Nevertheless, the thesis cautions that past interpretations of the medieval Nile network – that of Toussoun in particular – have subsequently acquired a canonical status that does not recognise the under-determining quality of the underlying textual data, and hence the plurality of possible outcomes that Ball notes. For example, though it was not a core objective of this thesis to propose a Cartesian interpretation of the Nile Delta as described by the pre-Islamic Greco-Roman authors, it did delve into the Nile descriptions of this earlier period with the objective of discovering the layout of the Nile network on the eve of Islam. What it found in doing so was that the data emergent from these ancient texts is extremely vague – far too much so to venture a detailed and orthographic hypothesis of the configuration of the pre-Islamic Nile. Moreover, it is worth considering that the uniformly seven-branched model of the Nile proposed by authors before Ptolemy Claudius bears the hallmark of a normatising *topos* that adheres to a particular tradition of Nile representation, rather than each author offering an independent description of his contemporary Nile. Finally, contemporary scholars such as Toussoun and Ball have continued that normatising tradition by accepting the Delta descriptions of ancient authors, already cursory, on face value; by assuming continuities in the real Delta waterway network between the dates of these authors; and finally by projecting a correlation between those waterways and waterways existing today. The result is a complex edifice of contingent assumptions that result, for example, in the Bolbitic branch of Herodotus being identified with the modern Rashīd branch in its entirety, even though Herodotus does no more than say a branch of that name existed. In sum, our knowledge of the layout of the Nile Delta of antiquity — and by extension on the eve of Islam – is far less certain than the interpretive maps of Toussoun and Ball imply. The same can also be said of Toussoun's interpretation of the early Islamic author Suhrāb: Toussoun is highly over-interpretive of the original manuscript, which is often vague and contradictory. Thus the ready reproduction of Toussoun's maps, in particular by geologists (Said 1981: 82-3; Stanley, Warne *et al.* 2004: 924; Stanley 2007: 12), lends an authority to his particular interpretations that is not justified. An almost incidental conclusion of this thesis, therefore, is that scholars know less about the layout of the pre-Islamic Nile Delta than is apparent from these oft-reproduced maps.

The medieval data has proved altogether more conducive to cartographic interpretation, largely because of the extensive use of place names to identify routes, and the persistence of many of those names today. Relying particularly on authors such as Ibn Ḥawqal and al-

Idrīsī, but drawing extensively on the wider medieval cannon and on modern geological and geoarchaeological scholarship, a hypothesised reconstruction of the waterways of the Nile has been presented in cartographic form in Appendix 2 of this thesis, and on the accompanying DVD. Inevitably, emanating from the courtly scholarship of such centres as Baghdād, Sicily and Cairo, these descriptions tend to concentrate on long-distance routes, at the expense of more localised waterways and journeys. It is quickly apparent that the layout of lesser waterways, which did not link major settlements and ports, is immediately more vague: it is in the lesser distributaries branching from the Dumyāṭ branch, for example, that the data of Ibn Ḥawqal and al-Idrīsī become problematic and difficult to interpret. Thus, while the approach taken in this thesis has yielded a potentially useful interpretation of the major Nile waterways and the routes taken between major ports at the extremities of the network, it has shed considerably less light on travel and navigational activity at a more local level, and along more minor waterways. Indeed it has little to say on more localised communication along even the large waterways – for example, between nearby towns on the main Nile of Upper Egypt.

Despite these shortcomings, the thesis has nevertheless created a working chronological model of the major medieval waterways of Egypt, identifying, *inter alia*, a candidate route for the Nile-Red Sea canal; the very existence of a route to Alexandria through the al-Ḥāfir canal and the coastal lagoons; the changing route of the main Alexandria canal; and the significance of the Tinnīs branch as a major waterway serving the eastern Delta in the period. By using ArcGIS software, moreover, the interpretation is presented in a georeferenced format that stands as a reference for future ground-based investigation of the medieval riverscape: in contrast, the dependence of Toussoun and Ball's descriptions on now-changed or lost landscape features, and the low resolution of their accompanying maps, make it in many cases impossible to follow entirely their intended routes in today's landscape.

The attempt in Section 3 to represent the medieval Nile in Cartesian form has laid the foundations for an interpretation of navigational conditions and strategies on the river network, setting out the possible routes for riverborne traffic. Section 4, on navigating the Nile, has considered the Nile as a navigated space. In particular, it has established the pronounced *seasonality* of navigation on the Nile. Far from being a navigational constant, the river was a place of unceasing hydrological and meteorological change. That the Nile flooded on an annual basis is hardly a revelation to emerge from this research. However the impact on navigation of the hydrological cycle of the Nile has hardly been contemplated previously. This thesis has highlighted the difficulty, and indeed danger, of

navigating the river during the low Nile period, from about April to June, for any but the smallest Nile boats, and has established that large mercantile vessels were laid up during this time for want of suitable draught. It has also noted that the period of high Nile, when water levels rose and river current speeds accelerated, was also the period during which northerly winds were at their strongest and most persistent – arguing for this as the period of peak navigational activity on the river. It has also established that it was with the flood that the great seasonal canals of Egypt – not least the Alexandria canal and the Nile-Red Sea canal – became navigable, their seasons of navigability lasting from September to about December or January. It has contemplated the interface between the Nile sailing season thus established and the sailing seasons of the Mediterranean and the Red Sea. It has established that the arrival of trans-Mediterranean merchant vessels in late summer coincided well with the peak Nile sailing season and the opening of the seasonal canals identified here. It has also considered the implications of the Nile sailing season for the interaction with the Red Sea, and has suggested that this has implications for the respective rôles of ports such as al-Qulzum and 'Aydhāb. (However, a great deal more research is required in this direction to understand the ramifications of Nile seasonality for Nile-Red Sea communications, and for trade in particular). Finally, Section 4 has established the Nile mouths of the Rashīd and Dumyāṭ branches as key determinants of maritime activity on the Nile. These points of encounter between the river and the sea were dangerous, and notoriously so. The risks that the Dumyāṭ mouth presented to shipping informed the importance of Tinnīs as a medieval port, and of the Tinnīs branch that served it. Meanwhile, it has been demonstrated that the difficulties of the Rashīd mouth diminished the importance of the eponymous city, and augmented the role of Alexandria (as well as the Alexandria and al-Ḥāfir canals that served it) as much as did the excellent sea harbour of the latter.

In considering the navigational conditions of the Nile, this thesis has rejected the notion that the river was a benign, safe or 'easy' medium for waterborne transportation, populated by navigators who were the essentially passive beneficiaries of a uniquely accommodating coincidence of 'given' environmental factors. Navigating the river was *not* simply case of being carried north by the current, and south by the wind, regardless of place, time or season. Such interpretations are perhaps to be charitably interpreted as the enthusiastic outcome of contrasting the effectiveness of river transportation with the more cumbersome process of movement on land – but they smack of orientalism and its passivisation of the human object of its enquiry into essentially simple and technically incapable 'types', rather than skilled and knowledgeable agents engaging with a complex navigational environment as surely they were – not to mention of a romanticist disengagement from the landscape

(Said 1978: 201 ff.; Said 1993: 202; Johnson 2007: 141-7). It is rather the case that medieval Nile navigators required a deep and extensive knowledge of season in winds, river levels and the interaction of their own navigational world with the active seasons of the adjacent seas and desert routes, of the play of winds within the local topography, of draft and Nile levels, of dealing with groundings and gusts, of appraising and negotiating Nile mouths and cataracts, and of the specific hazards of particular locations *en route*. Moreover, successful navigation required of them a bodily engagement with the riverscape. Waterways and their hazards had to be actively negotiated, not just passed along: attention had to be paid to local variability and sudden change, which could be catastrophic. Winds were not always favourable. Crews had often to tow, punt and row for extended periods, sometimes days. In sum, Nile navigation required brain *and* brawn. Sturt (2006: 120) argues that: "... maritime archaeology's point of engagement with the environment forces a more sensitised approach to space, temporality, and change than occurs in terrestrial archaeology." The Egyptian Nile offers an example *par excellence* of the structuring qualities of natural cycles in informing the engagement of humans with their bio-physical environment.

This engagement was, moreover, a social process, requiring the reproduction and transmission of knowledge and skills between individuals (Farr 2006: 88). If skill and knowledge was required in order to navigate the Nile, then those skills had to be nurtured, transferred, and exchanged. By exposing Nile navigation as just such a process, Section 4 opens up new vistas of enquiry that run beyond the scope of this thesis. If skill and knowledge was required to navigate the Nile, how was it passed on? What were the social and kinship structure of a Nile vessel's crew, and how were these mediated? How did the young (and old) acquire navigational knowledge, and from whom? Did women have a place on board? How did a crew travelling long distance along the Nile 'trade' with riverside communities for local expertise on very localised conditions? Why was one route chosen over another? These questions of social process have been raised, but not answered, using the approaches and data adopted in this thesis. They perhaps also ask for a more anthropological approach to Nile navigation, drawing on ethnographic enquiry among living communities who still recall the pre-1964 Nile. Such an approach might also yield valuable insights into the cognitive aspects of the landscape experienced by Nile navigators, which this thesis has hardly touched upon.

It is tempting, as a product of the enquiries of Sections 3 and 4 of this thesis, to start building a model of the Egyptian 'maritime cultural landscape' that reflects the transport-geographic preoccupations of Parker (2001), and particularly Westerdahl (1994). From

such a perspective, the troublesome Nile mouths, the obstacle presented by the First Cataract, perhaps also the entrances to the seasonal canals (dammed to conserve water within them) accord neatly with Westerdahl's characterisation of *transition points* standing between different *transport zones* within which different forms of maritime activity take place according to transportational function, ship type, and the dictates of the marine environment. From this perspective, the Nile mouths represent transition points demarcating the separate transportational zones of the river and the Mediterranean Sea, while at the other end of Egypt the First Cataract separates a zone of more-or-less uniform navigation lying downstream of it and running unbroken to the Mediterranean Sea from another quite separate zone lying upriver, beyond the rapids, in Nubia. Elsewhere, the mouths of the major navigational canals might equally be interpreted as demarcating the point at which transhipment took place between deeper-draughted Nile boats and smaller vessels better constructed to cope with the shallower conditions of these seasonal canals. From this perspective, the navigational boundaries of the Nile are seen to coincide with the limits of the reach of Egyptian political authority. The incoming Muslim rulers quickly established the First Cataract as the southern extent of the Muslim lands. And while sovereign authority extended easily along the Nile basin, it did not penetrate far into the surrounding deserts. From this perspective, the maritime cultural landscape of Egypt is not only defined by navigational exigencies, but also, once defined, this navigationally constituted space proceeds to determine the geopolitical extent of Egypt, which is maintained despite repeated change in Egypt's place within the Islamic imperial geopolitical superstructure.

However, while such an obviously functionally and geographically determinist approach reflects descriptively many aspects of medieval Nile navigation explored in this thesis, it falls short of capturing the complexities of the situation. On the one hand, it succeeds in noting the correlation between navigational and political boundaries, but it also implies both that Egypt's political boundaries were determined by navigational factors – that is, the interface of physical environment and technological capacity – while at the same time privileging navigational priorities over the geo-political.

In fact, the exploration of the location, chronology and function of a number of major Delta, Red Sea and Nile valley ports of the medieval period begins to cast doubt on the navigational-functionalist approach to the navigated landscape of medieval Egypt. For example, navigational priority cannot explain why it was that the Red Sea ports that served the Nile valley changed so radically during the centuries under consideration. This thesis has narrowed considerably the gap, in terms of 'ease' of navigation, between the Nile and

the northern Red Sea. That navigating the latter was difficult has long been established. That the Nile was not the safe, easy and relatively fast alternative is a central conclusion of this thesis. Thus the functionalist argument that ports placed further south on Egypt's Red Sea coast – 'Aydhāb and al-Quṣayr in the medieval period, Berenike and Myos Hormos in earlier periods – existed simply because they enabled a southerly exit from the difficult Red Sea and the utilisation of the navigationally 'easy' Nile is already called into questions. Add to that the radical shift in the primacy of these ports over time – from al-Qulzum to 'Aydhāb to al-Quṣayr – and the conclusion to be drawn is that whichever of these ports represented the 'easiest' route navigationally, that 'easiest' route was not always used. Likewise, if Tinnīs and its eponymous branch offered the best route through the eastern Delta, avoiding the troublesome Dumyāṭ mouth, then why was it ultimately abandoned in favour of Dumyāṭ?

The evidence considered in Section 5 of this thesis suggests that the navigational landscape of the medieval Egyptian Nile was not the product of uniquely navigational priorities. Rather, the placement of ports and the establishment of routes – routes being the product of practice rather than the physical waterways themselves – must be understood within the wider socio-political and geopolitical context of the polity that was medieval Egypt. The navigated riverscape of medieval Egypt was the outcome of a plurality of factors – environmental, nautical-technological, geo-political, economic, and even religious. It was not simply the maritime cultural landscape defined by transport zones and transition points.

As much as the medieval Egyptian Nile was a navigationally constituted landscape, it was also a political one. Smith (2003: 12-21) has argued for a reinstatement of landscape into archaeological perspectives on past polities, in contrast to what he sees as the Hegelian privileging of time as the progenitor of socio-political change and formation. The medieval Egyptian Nile is an exemplary case study. The coincidence of environment, navigation and geo-political boundary at the transition points comprising the Nile mouths and First Cataracts has already been noted. But the political nature of the navigated landscape of Egypt goes much deeper. Immediate examples of the political production of navigated space are the great seasonal canals, among them the Alexandria canal and the Nile-Red Sea canal considered in this thesis. These canals were not executed – and maintained year after year – in fulfilment of abstract navigational expediencies. As Smith expresses it for Mesopotamia, such structures constituted the "promulgation of ... political interests" and "presume an existing set of political interests that vest status in exotic trade, that predicates political economy on a diverse base of subsistence resources, and that founds geopolitics

on the exchange of bulk commodities" (Smith 2003: 279). Smith is arguing here that the 'advantages' to a society of a given biophysical environment are not inherent, but are contingent on socio-political context. From another perspective, the navigable waterways that these artificial canals comprise have to be seen not only in terms of the navigational conditions experience by, and advantages conferred upon, those travelling along them, but also of the socio-political processes that created them. We have seen that Ibn Qalawūn in the 14th century was persuaded to re-excavate the Alexandria canal in pursuit of higher customs revenues from mercantile trade, and the extension of irrigation in pursuit of higher land-tax revenues and the establishment of new settlements. Earlier, the re-excavation of the Roman Nile-Red Sea canal had been one of the first acts of the Muslim conquers of Egypt. The reinstatement of the canal incorporated expressed geopolitical change and economic reorientation in the very fabric of the landscape. The ability to mobilise the labour required to create these channels and maintain them annually further invested them with political meaning – these canals inculcated political authority. The ritual surrounding the reading of the nilometer and the opening of the seasonal canals was not only a means of co-ordinating the distribution of the Nile flood. It also played out in ceremonial form the control of the élite of the day – the Fatimid Caliphs, the Mamluk Sutlans – over the river system in its entirety. The very name given to the Nile-Red Sea canal in the seventh century – the Canal of the Commander of the Faithful – expressed the new political relationship with the Ḥijāz, and the severing of links with Constantinople. The changing priority given to the maintenance of these canals – the abandonment of the Nile-Red Sea canal in the mid-eighth century, the renewed investment in the Alexandria canal in the Mamluk period – reflect not only changing environmental and navigational needs, but the reconfiguring of the geopolitical interests of Egypt's ruling elite.

Movement on the seasonal canals – and indeed on the perennial waterways more generally – therefore constituted participation in the 'theatre of state', to borrow from Olwig (2002: 219). Since it was the ruler who made that movement possible through hydro-engineering projects, co-ordination of the distribution of the waters, and the ritual exercise of divine legitimacy over the miraculous Nile, then movement on the Nile implied submission to that legitimacy, and acceptance of the routes and imposts that that legitimacy entailed. The pontoon bridge across the Nile at Cairo and the chain across the river at Dumyāṭ further integrated state control into navigational movement.

Indeed, the hand of the state extended much further in creating the routes available to navigators than the direction of major works of hydro-engineering. The choice of whether to move goods north-south along the Red Sea or the Nile valley was not, again, simply the

context-free choice of a merchant or navigator selecting the navigationally or commercially optimal route among the contemporarily available options. The changing configuration and relative importance of Egypt's medieval Red Sea ports over time set out in Section 5 demonstrates that, whichever of these routes might be seen as the most *efficient* in terms of navigational and land-transportational exertion and expenditure – and on that the jury is still out – the same route was not selected in all periods. Equally important – indeed supremely so – was the role of the authorities in deciding, establishing and securing which route should, and could, be taken. Thus, a whole set of non-navigational factors – relations with the desert Beja, the Crusader military threat, the desire to channel (and tax) mercantile activity through the Nile valley rather than the Isthmus of Suez, the political status of the Arabian coast – all served to inform and determine the preferred maritime connections between the Red Sea, the Eastern Deserts, the Nile valley, the Delta and the Mediterranean Sea. In the Delta, the abandonment of the apparently excellent port of Tinnīs in favour of the navigationally far more problematic Dumyāṭ was not the result of environmental or navigational change, but of the Egyptian leadership's changing response to external military threat. While the suggestion of such a complex calculus in settling the waterborne routes of Egypt may seem to be a statement of the obvious, given the relatively detailed understanding we have of Egypt's political predicament in the medieval period, it nevertheless stands as a caution to the use of such navigationally functionalist and reductivist explanations for the siting of Egypt's ports in earlier periods, and indeed elsewhere in the world.

The conclusion that the location of the medieval ports of Egypt considered here was not simply a function of navigational priority, but rather the outcome of a more complex and multidimensional set of factors, has implications for those conceptions of the maritime cultural landscape that present that landscape as the product of an essentially environmentally determined, structuralist transport geography. The problems encountered in defining a "maritime culture" as articulated by Hunter (1994) and Adams (2006) are equally as apparent in attempts to explain navigational activity in a given land, sea or riverscape exclusively in terms of the biophysical environment and nautical technological constraints. As the case of navigation of the medieval Egyptian Nile demonstrates, the choice of route, the location of a port, the very nature of fluvial travel was determined not by the biophysical landscape as a "neutral backdrop to activity" (Tilley 1994: 23), but by a complex interaction of far broader socio-political and environmental factors, of which the navigational experience was just one part.

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Appendix 1

Atlas of historical cartography

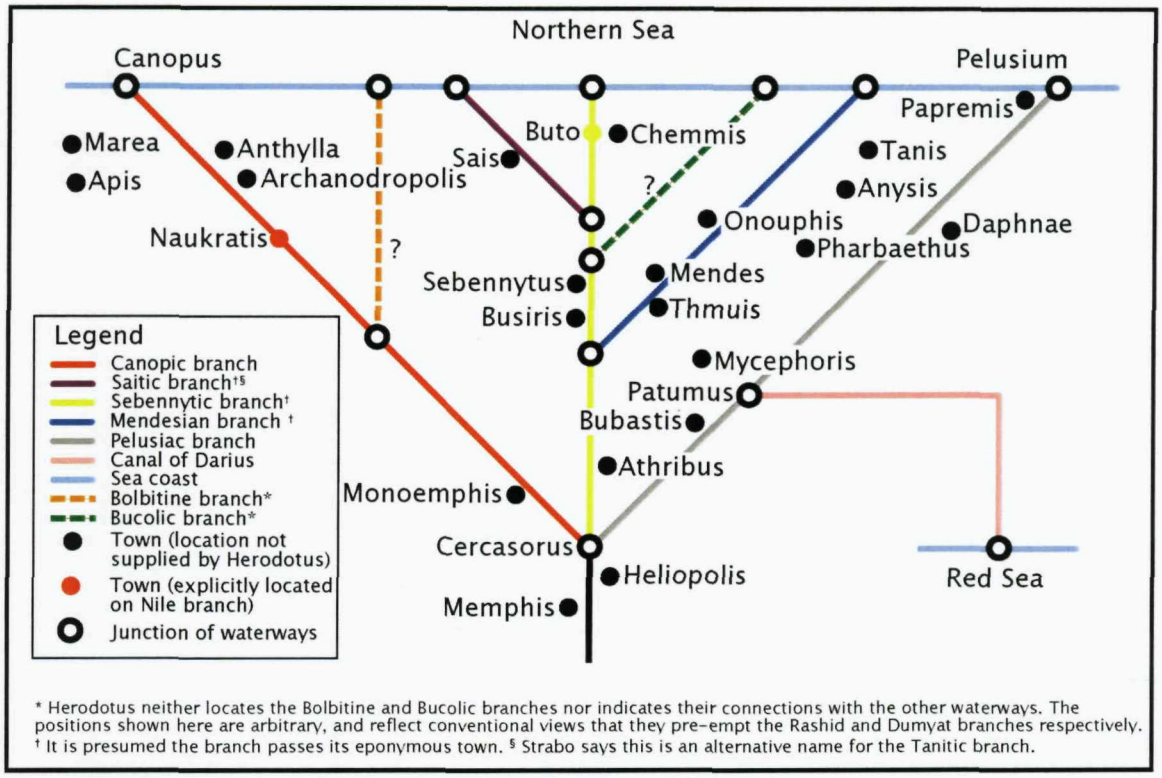


Figure 1: The Nile Delta, after Herodotus (5th century BC).

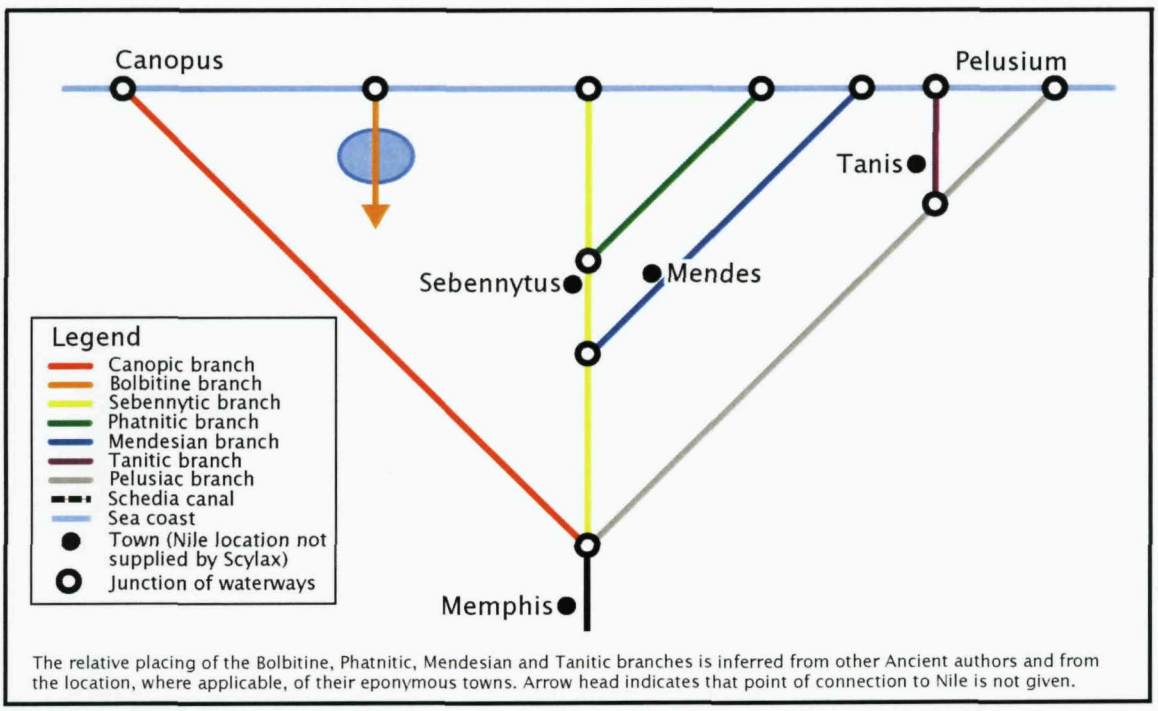


Figure 2: The Nile Delta, after Pseudo-Scylax (4th-3rd Century BC).

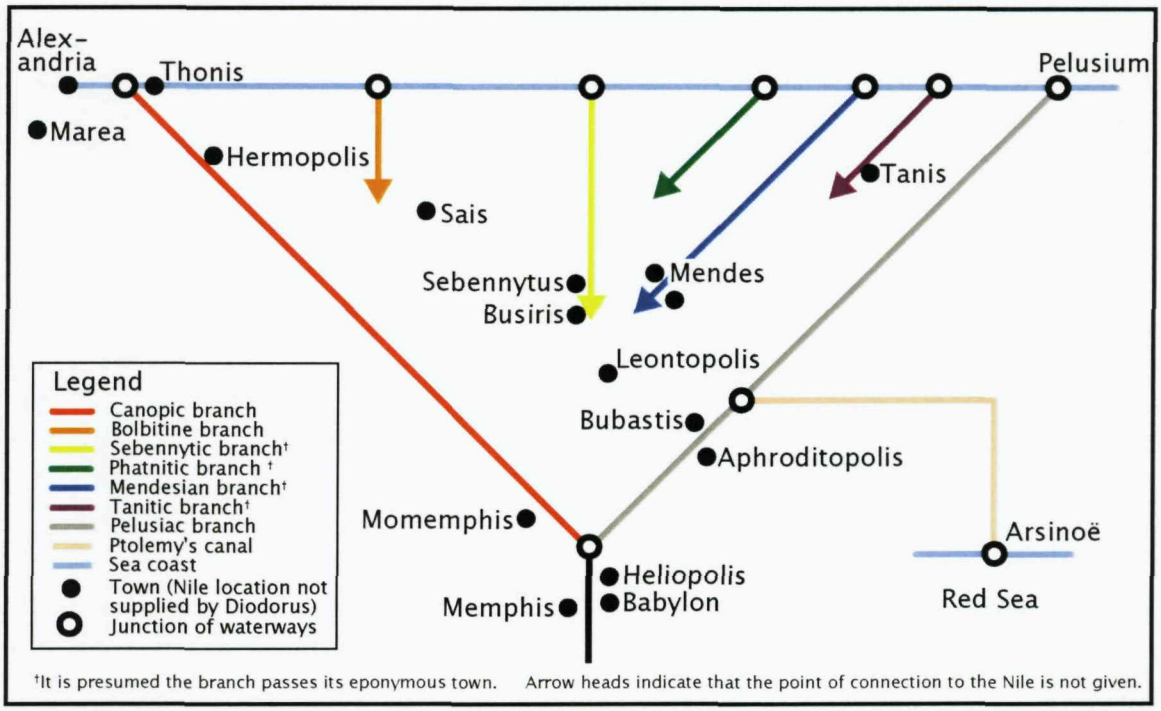


Figure 3: The Nile Delta, after Diodorus Siculus (1st century BC).

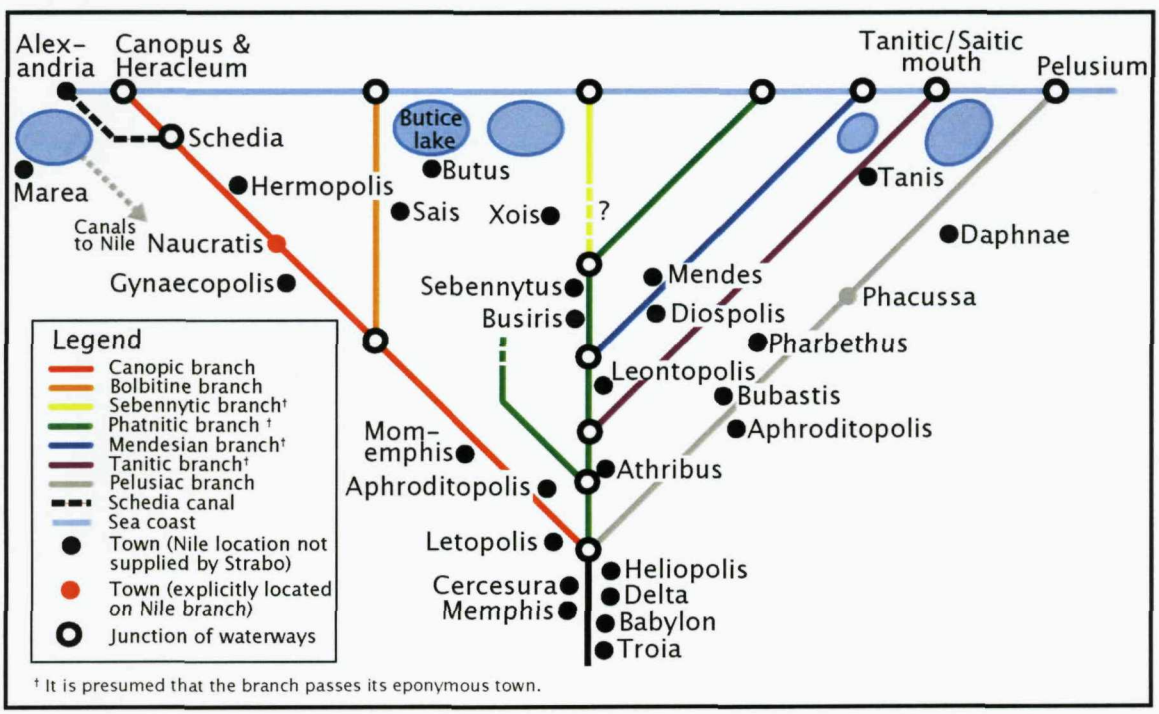


Figure 4: The Nile Delta, after Strabo (64 BC-24 AD).

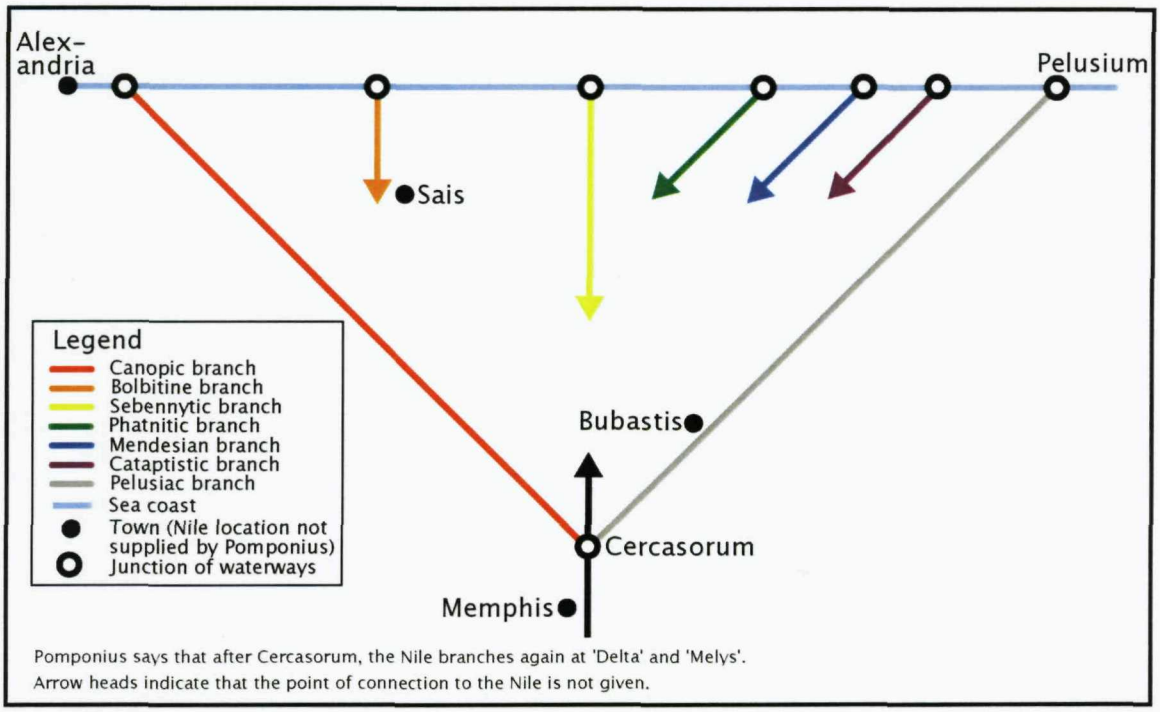


Figure 5: The Nile Delta, after Pomponius Mela (f. 40-41 AD).

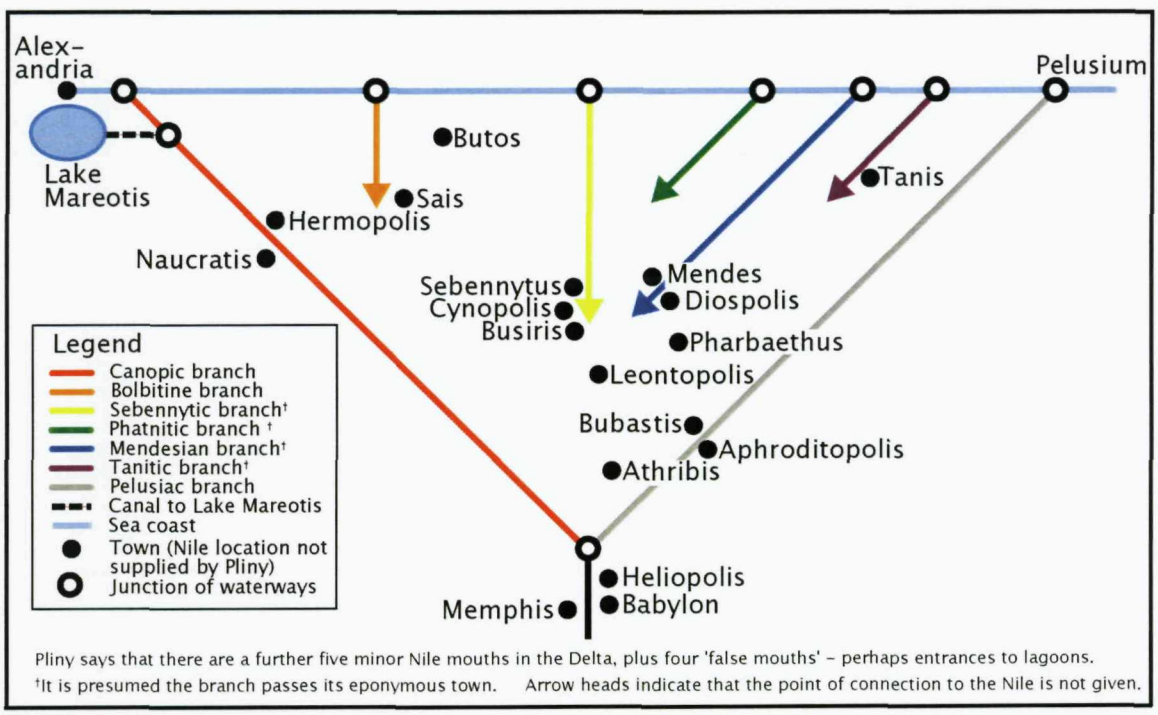


Figure 6: The Nile Delta, after Pliny (23-79 AD).

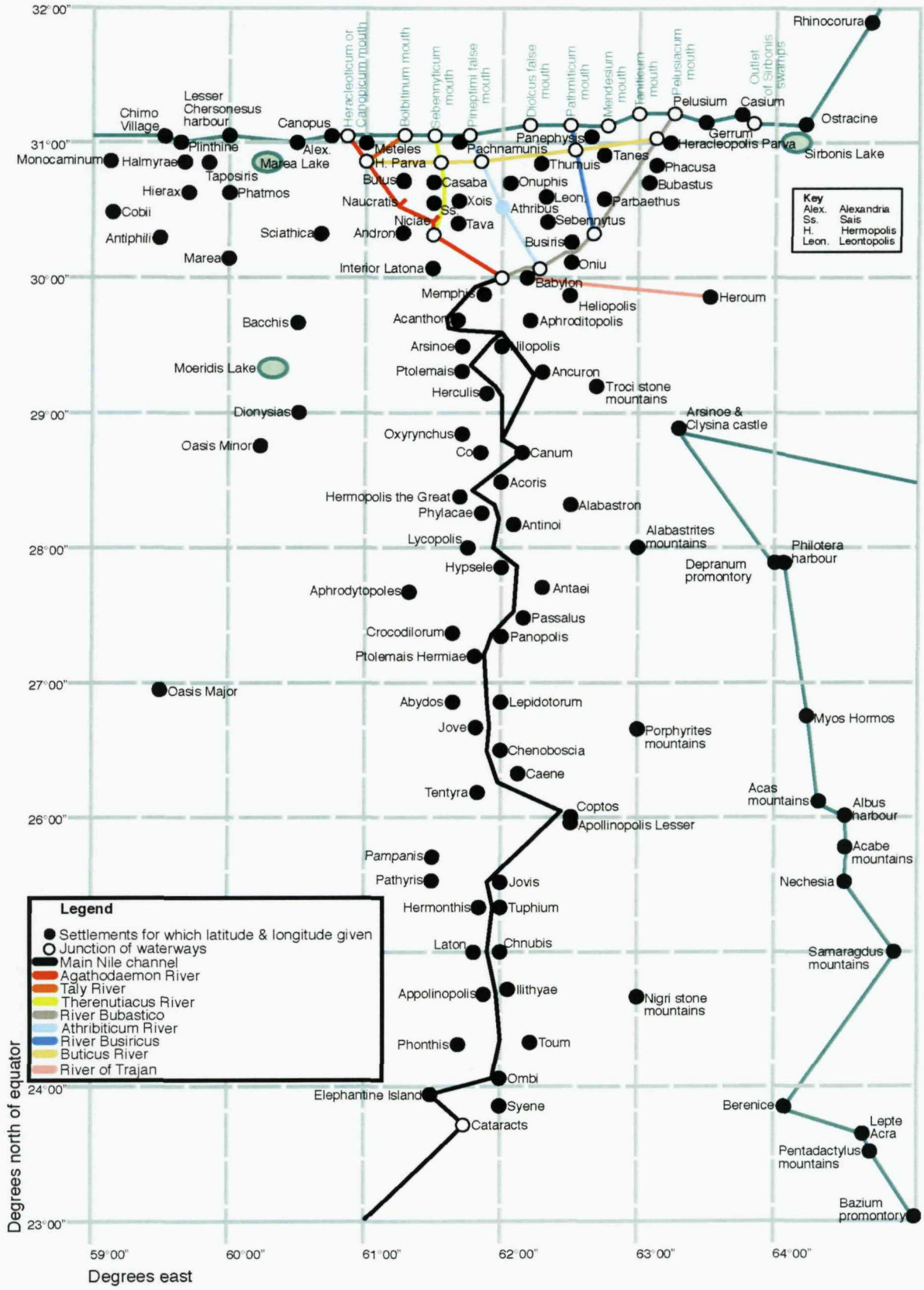


Figure 7: Egypt, after Ptolemy Claudius (c. 90-c. 168).

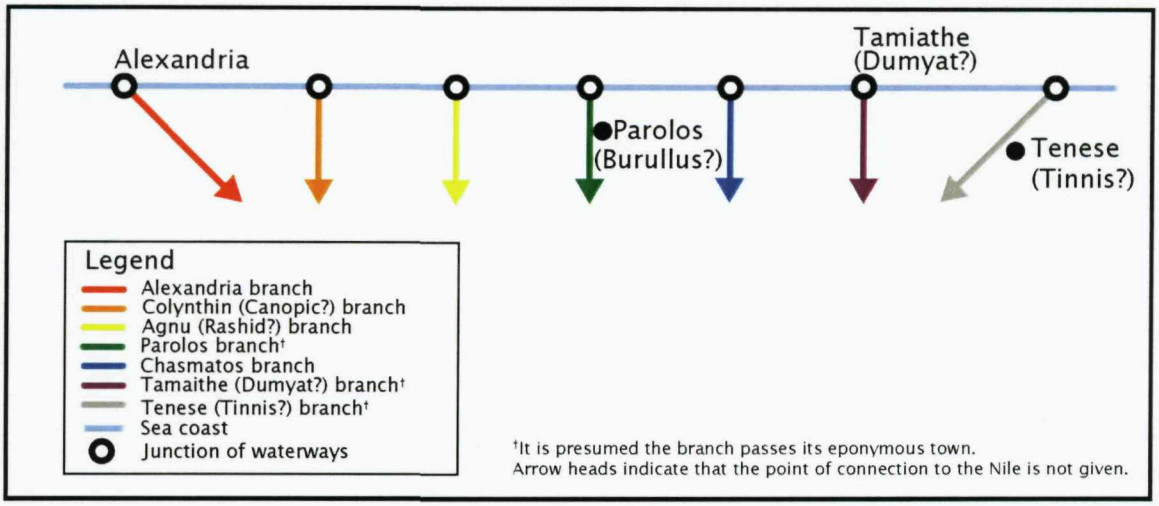


Figure 10: The mouths of the Nile, after George of Cyprus (early severnth century).

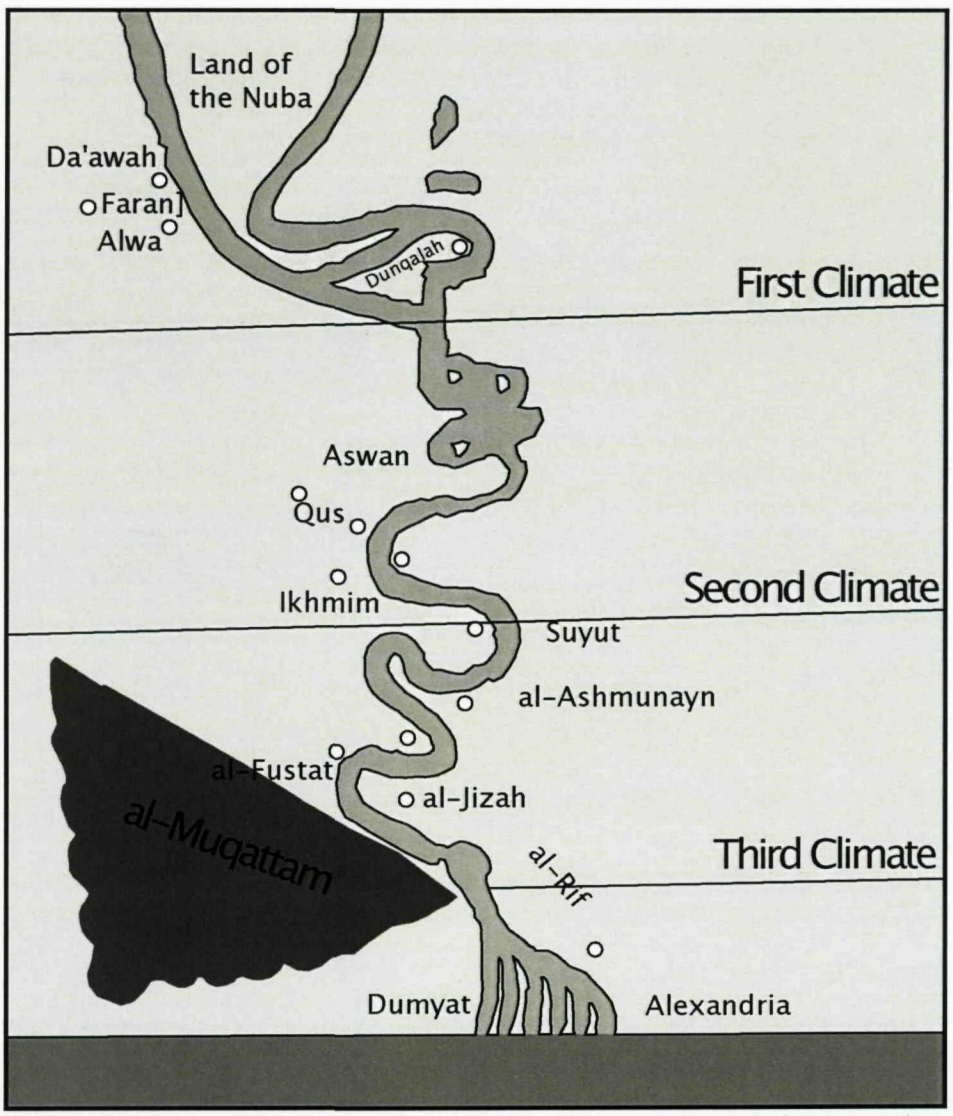


Figure 11: The Egyptian Nile, after the Strasbourg manuscript of al-Khawārizmī's Kitāb Ṣūrat al-Arḍ. The original work dates from the ninth century.

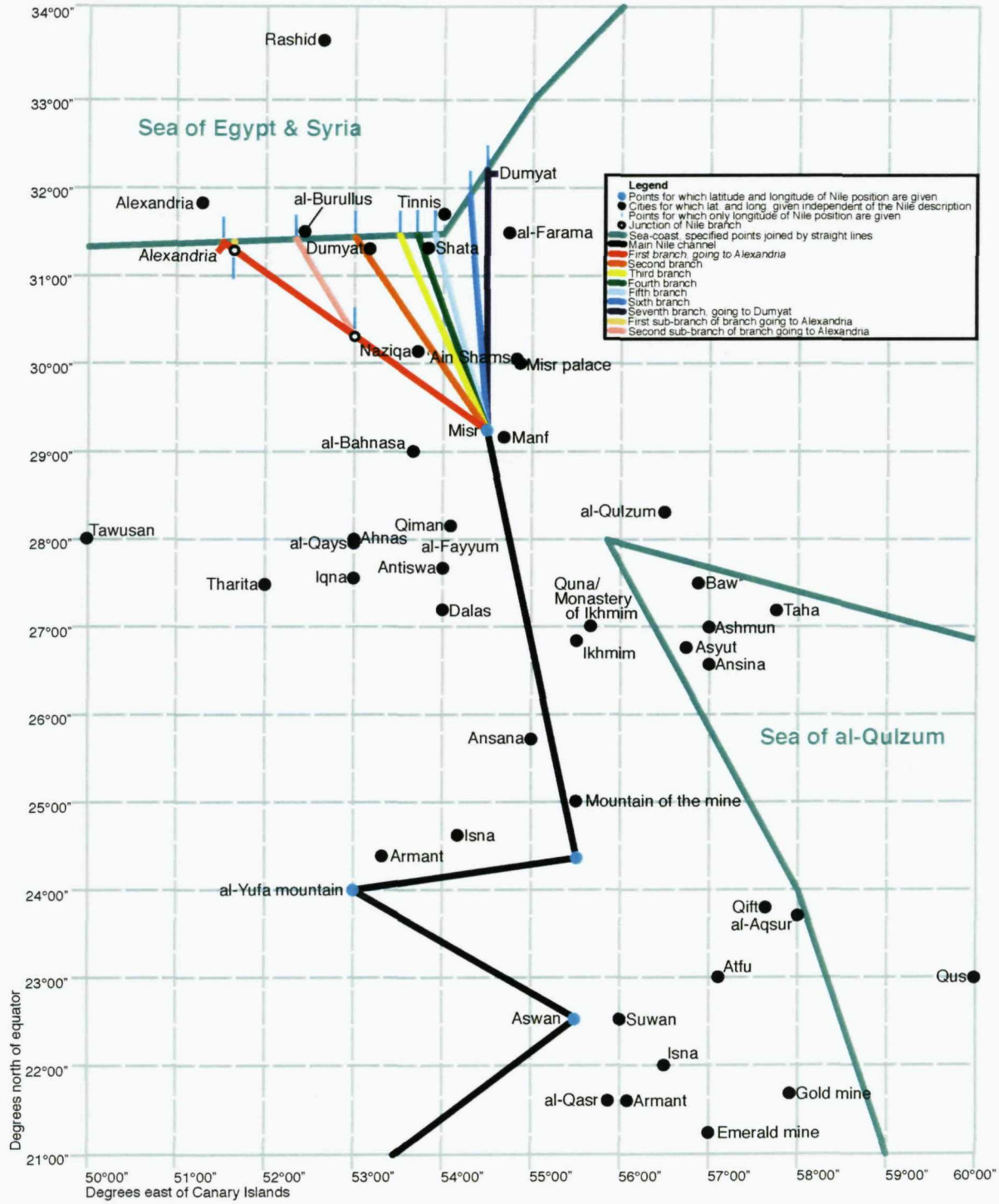


Figure 12: Egypt, after al-Khawārizmī (c.780-850).

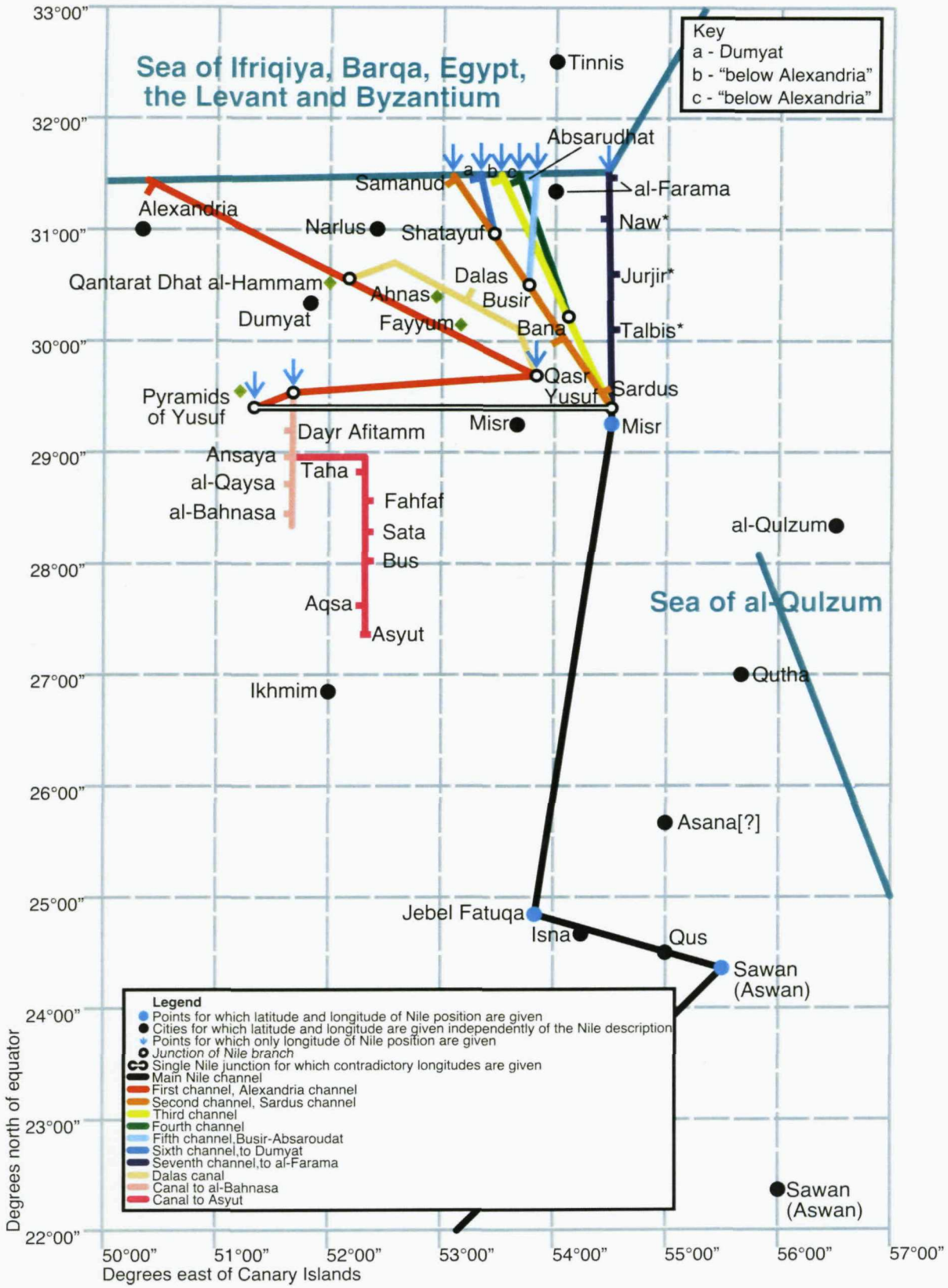


Figure 13: Egypt, after Suhrāb (Ibn Sirapion) (tenth century)

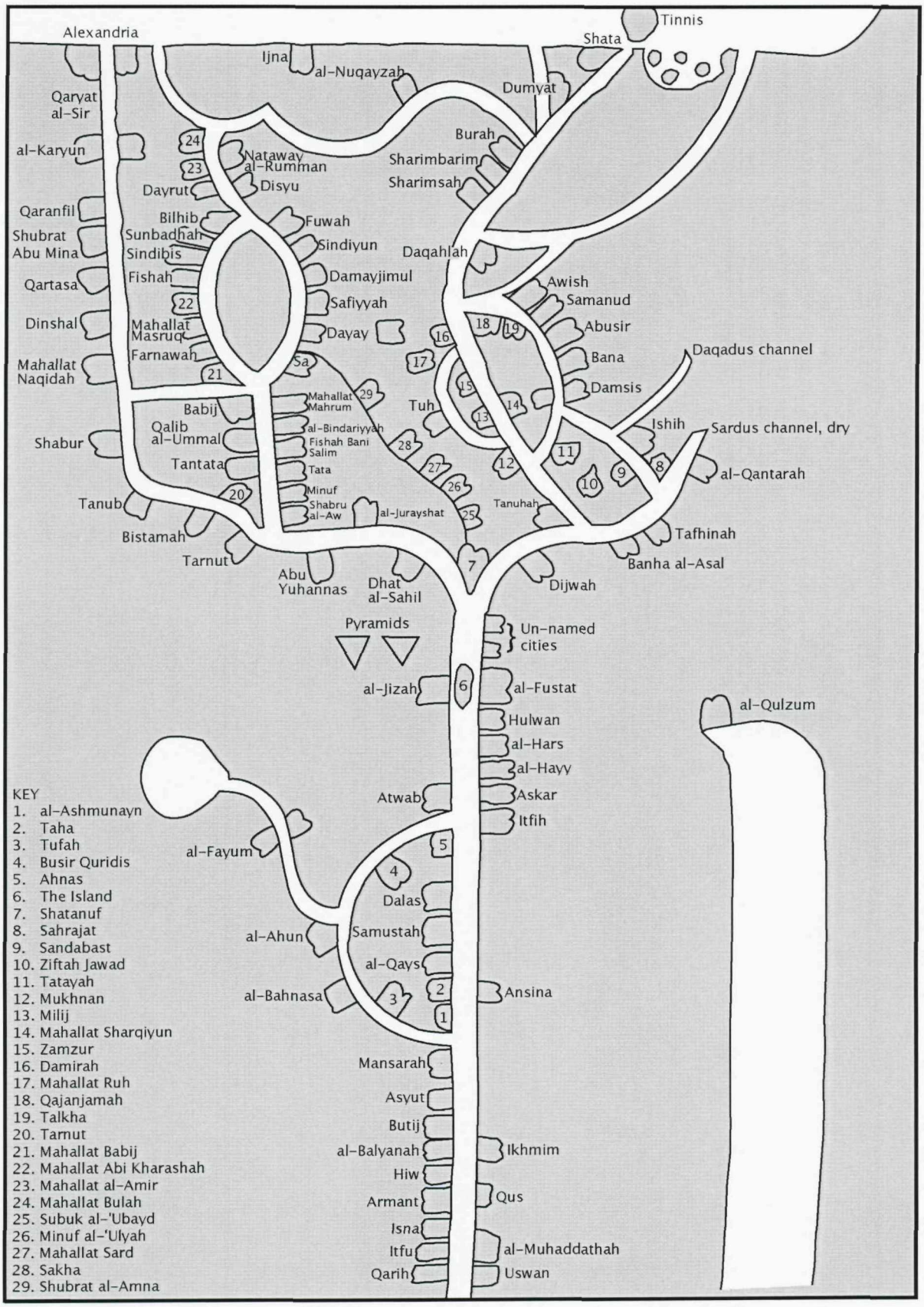


Figure 14: The Egyptian Nile, after an 11th century manuscript representation of Ibn Hawqal's map (MS Topkapi Sarayi 3346). (Kamal 1932: 3.2.658).

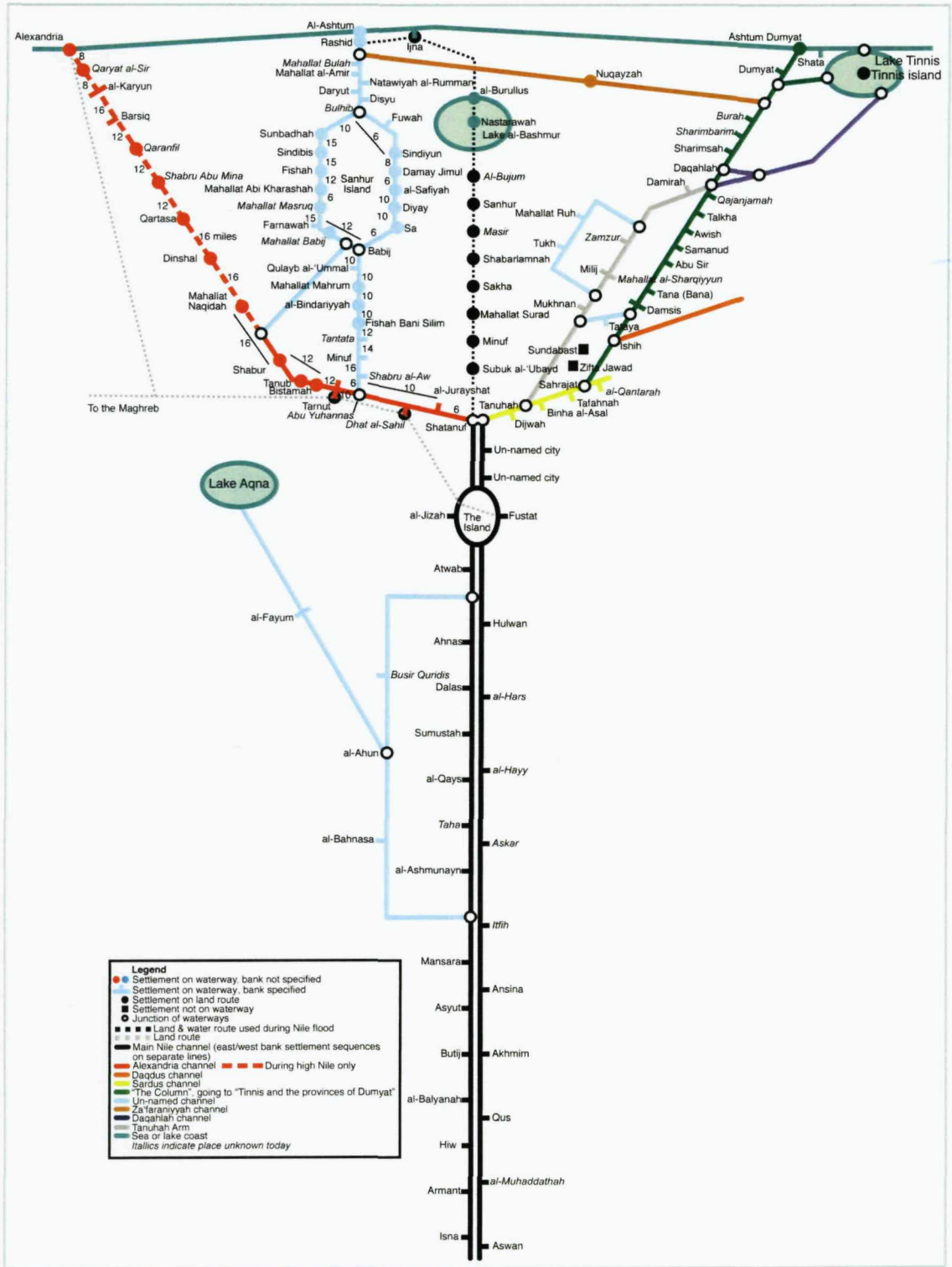


Figure 15: The Egyptian Nile, after Ibn Ḥawqal (f. 977)

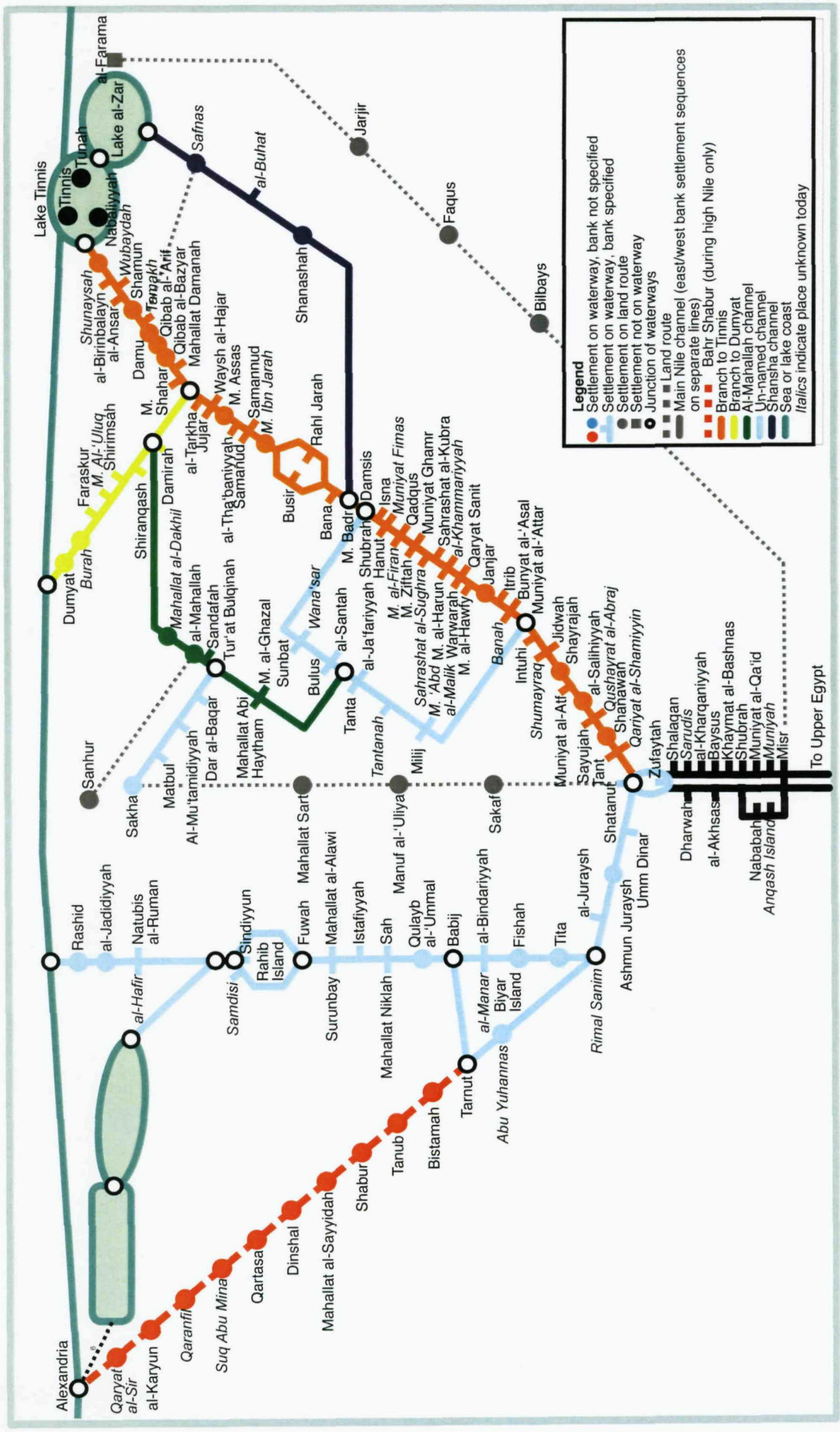


Figure 16: The Nile Delta, after al-Idrīsī (1154).

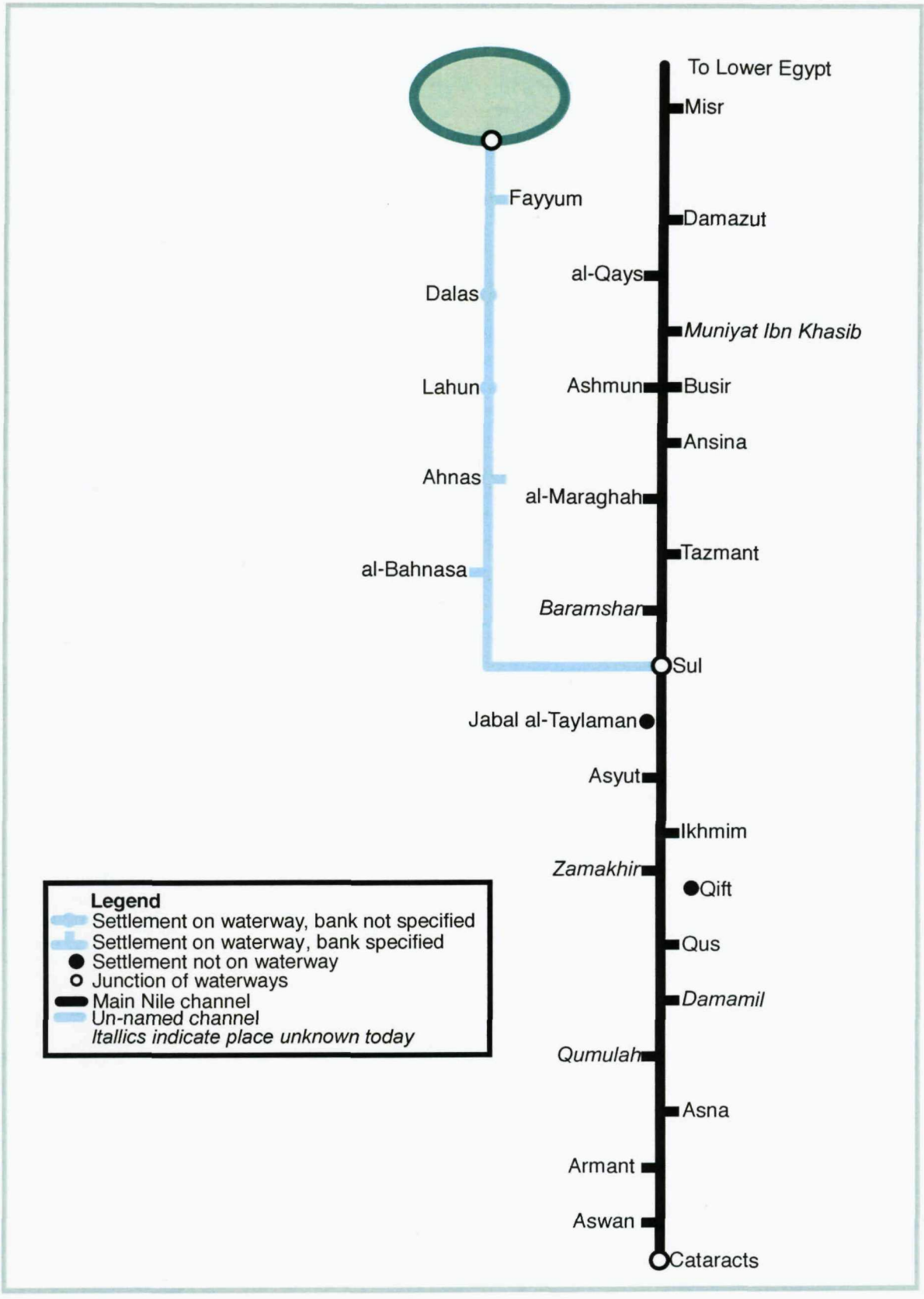


Figure 17: The Egyptian Nile valley, after al-Idrīsī (1154).

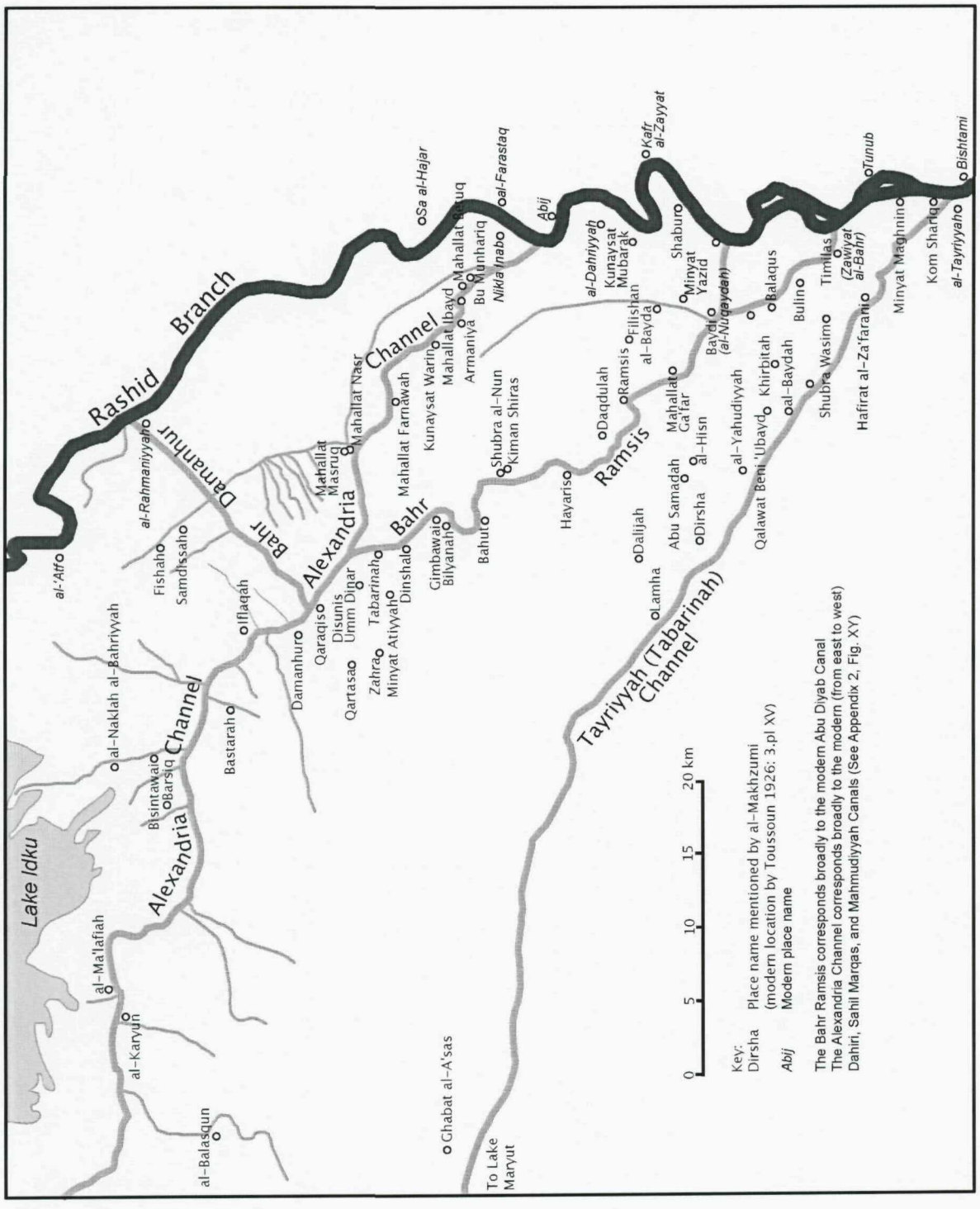


Figure. 18: The canals of the al-Buḥayrah region afterToussoun's (1.213-227, 3.pl.XV) interpretation of al-Makhzūmī (1183).

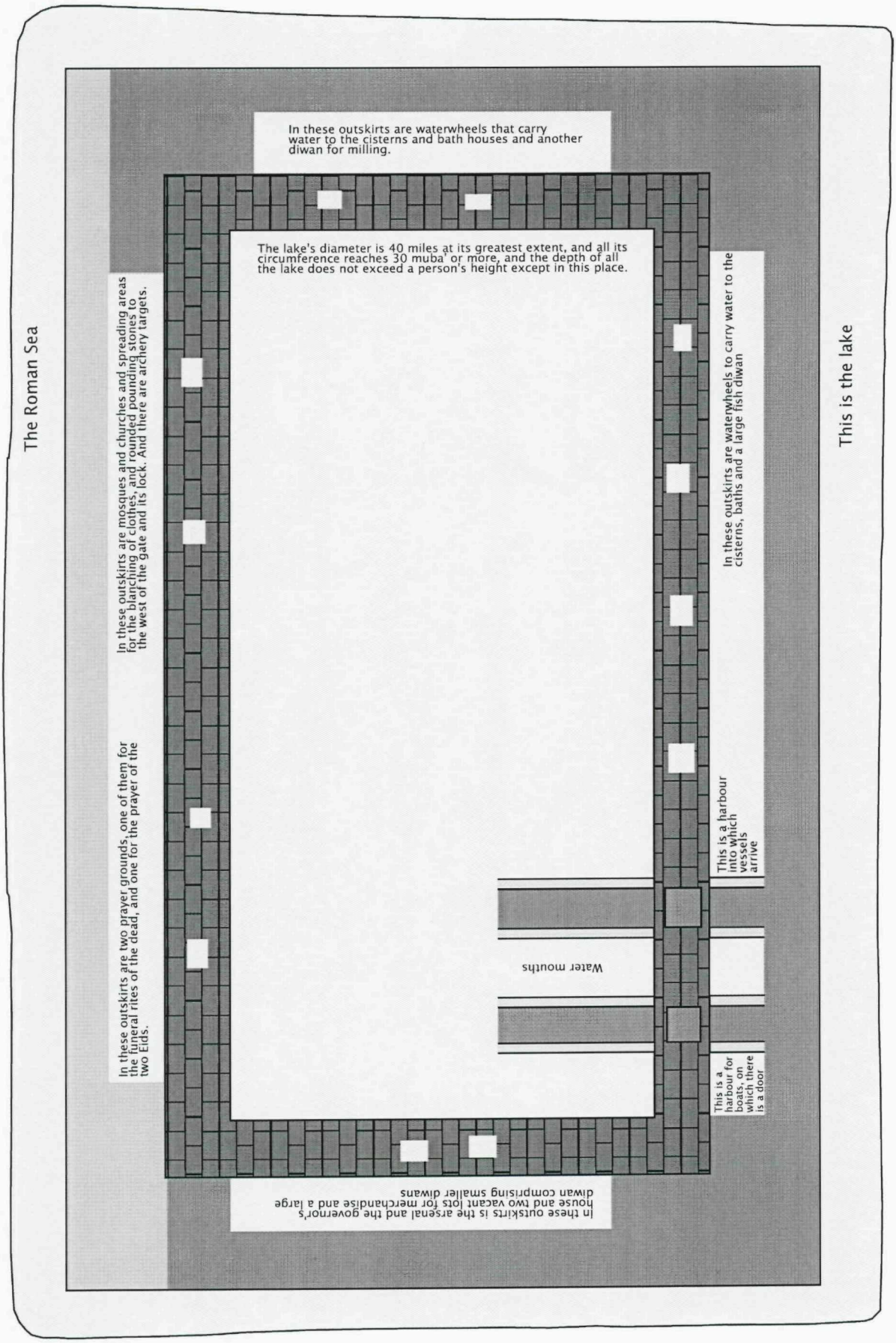


Figure 19: The city of Tinnīs, after the Book of Curiosities (Johns and Savage-Smith 2003).

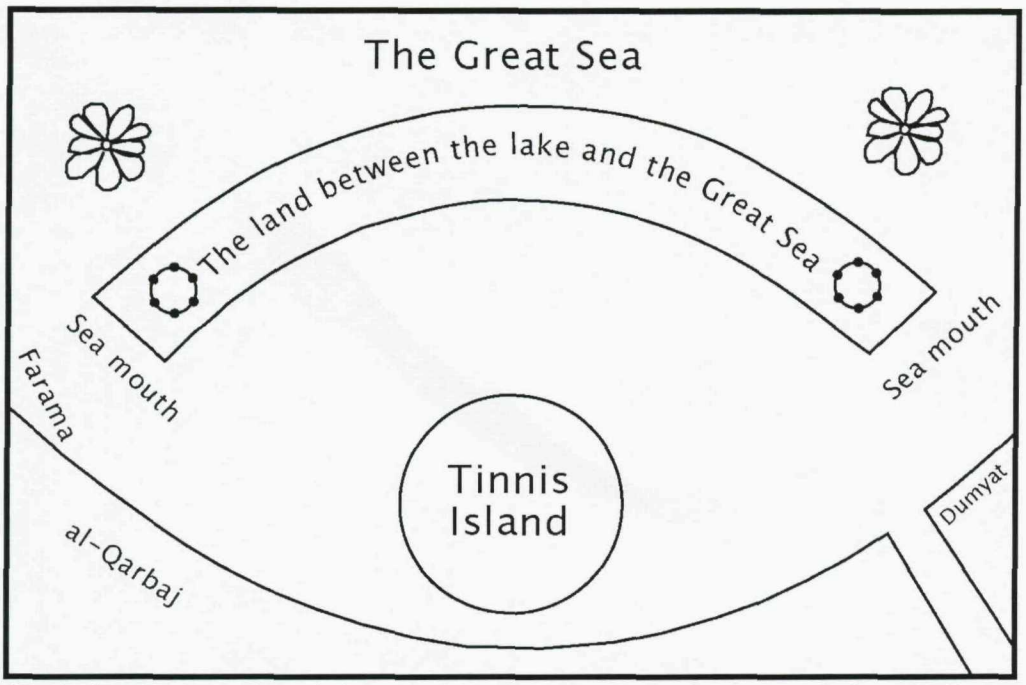


Figure 20: Lake Tinnīs, after al-Qazwīnī (d. 1283/4) (British Library Oriental Mansuscript OR. 3623: fol. 49r)

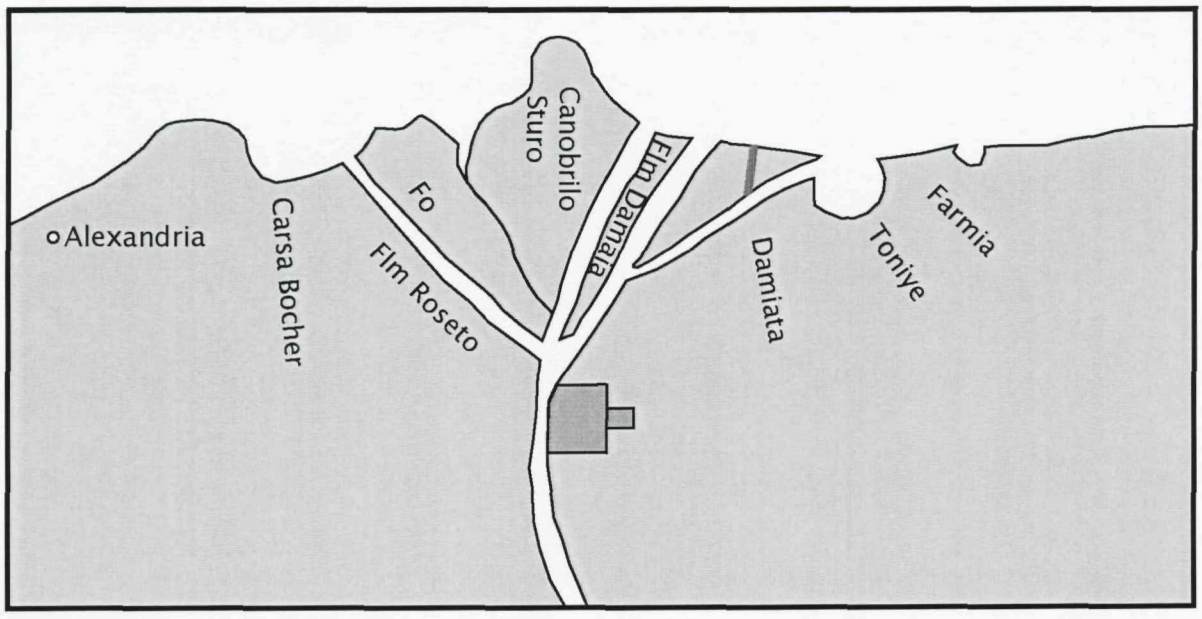


Figure 21: The Nile Delta after the Pizigani brothers (1367).

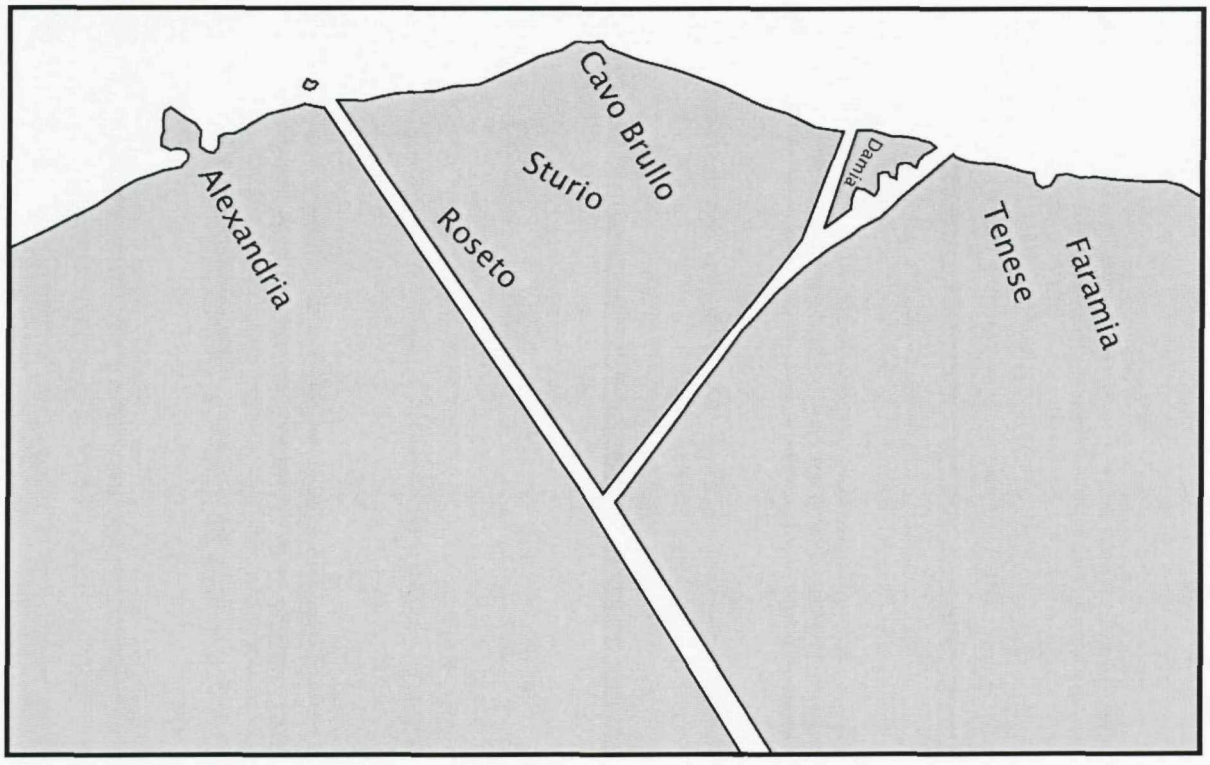


Figure 22: The Nile Delta after the *Carte Marine* (14th Century).

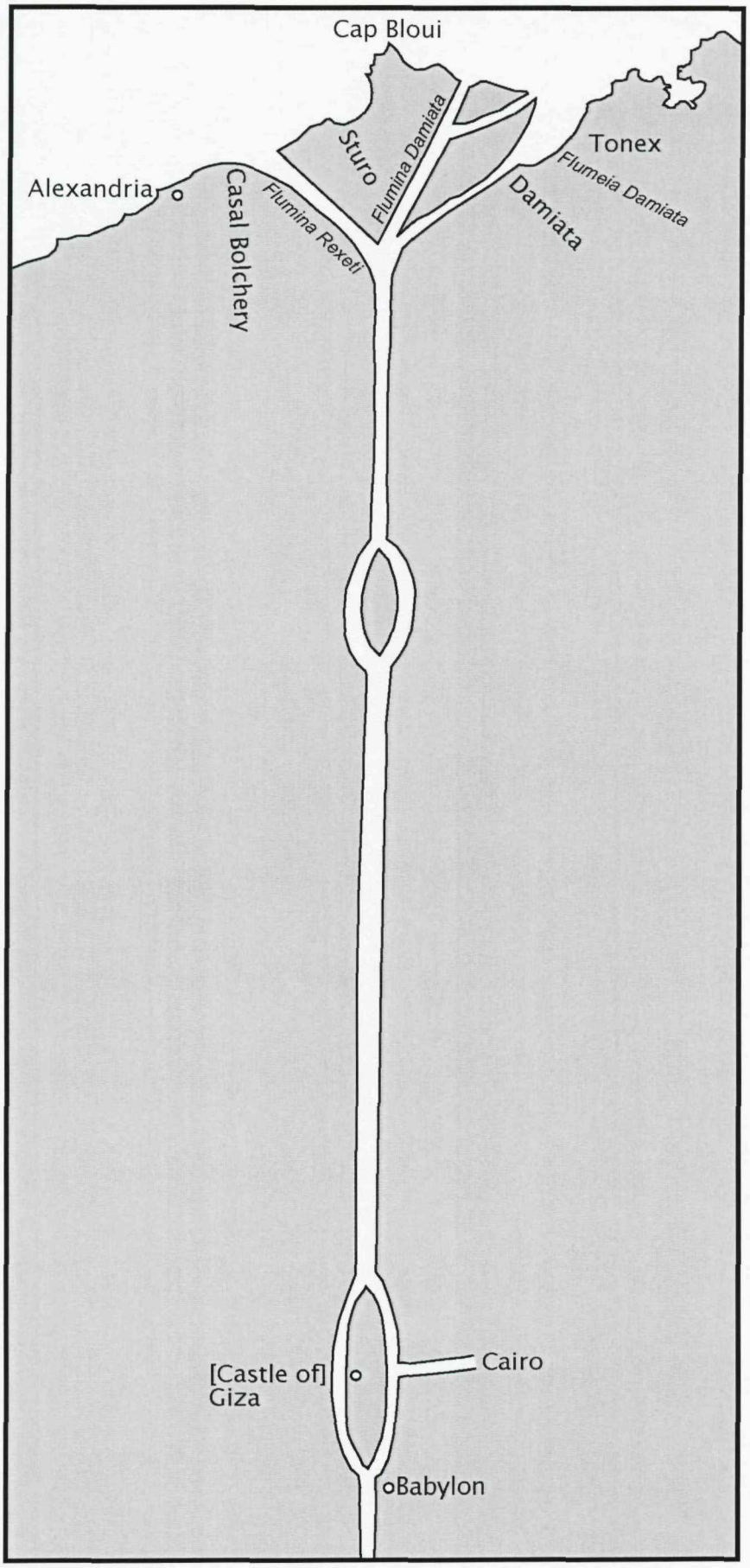


Figure. 23: The Nile Delta after Marinus Sanutus (1321).

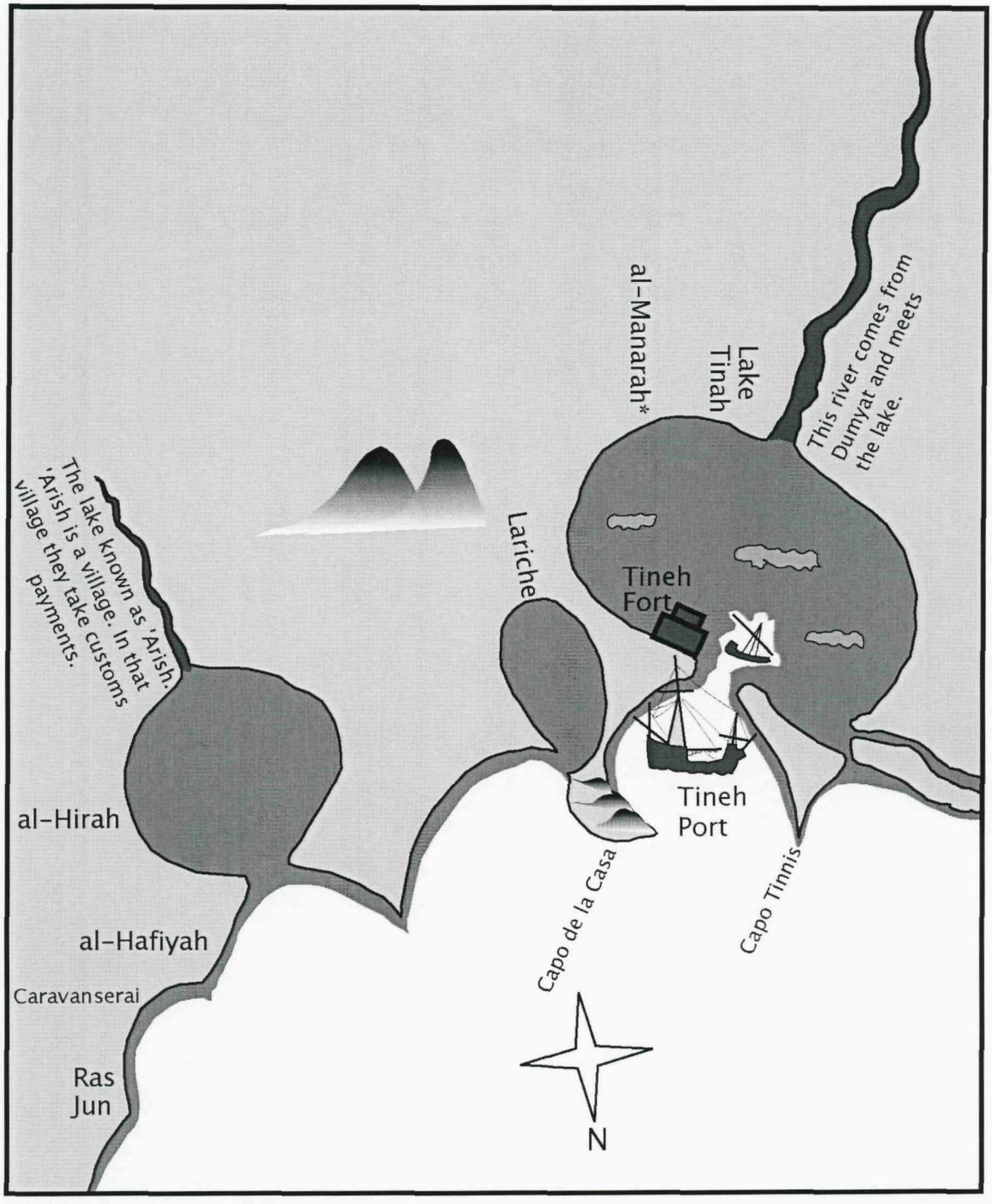


Figure 24: Lake Manzalah/Tinnis/Tinah and environs after Piri Reis (*Bahriye*) (1513).

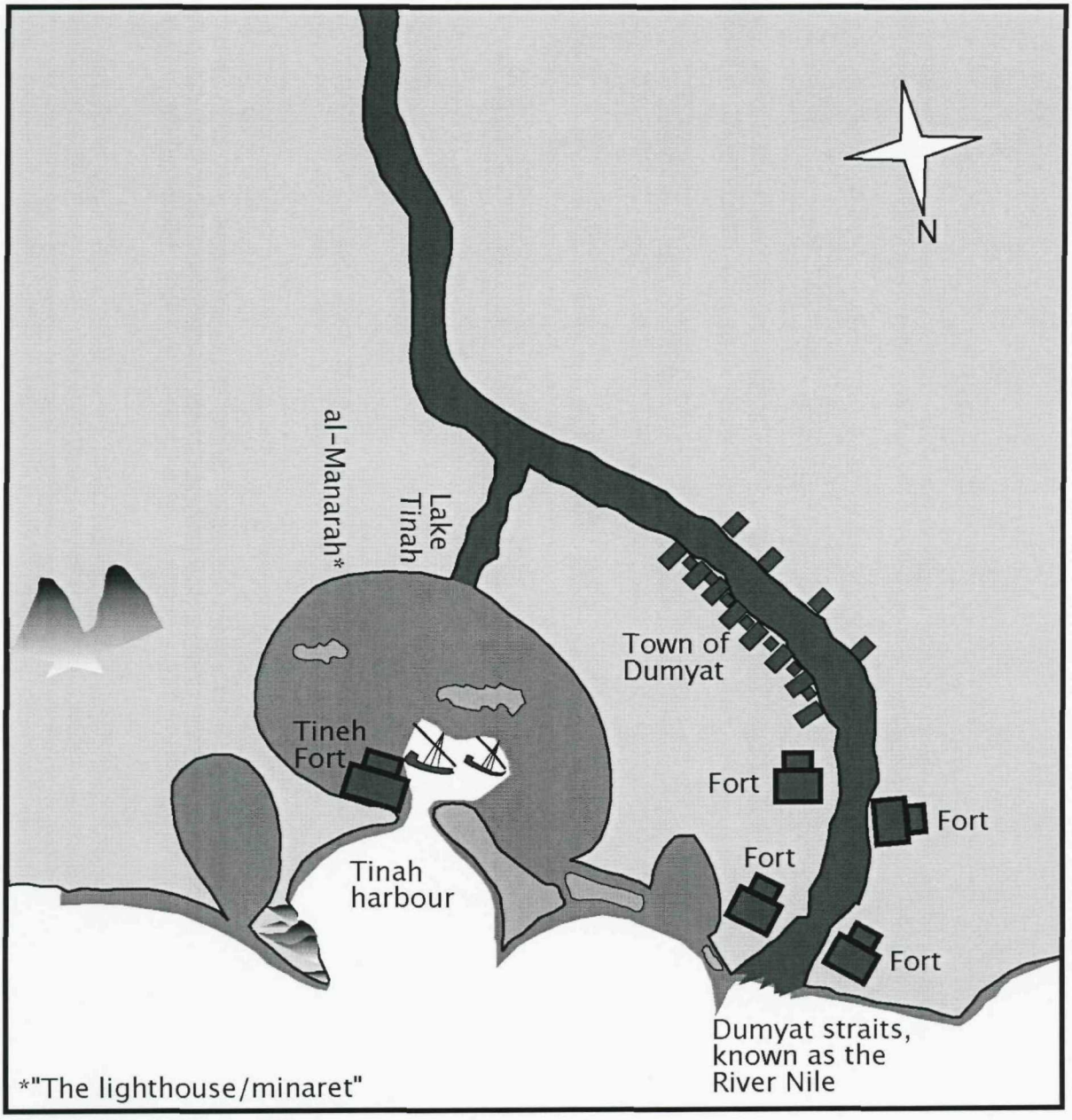


Figure 25: The Dumyat branch and Lake Manzalah/Tinnis after Piri Reis (*Bahriye*) (1513).

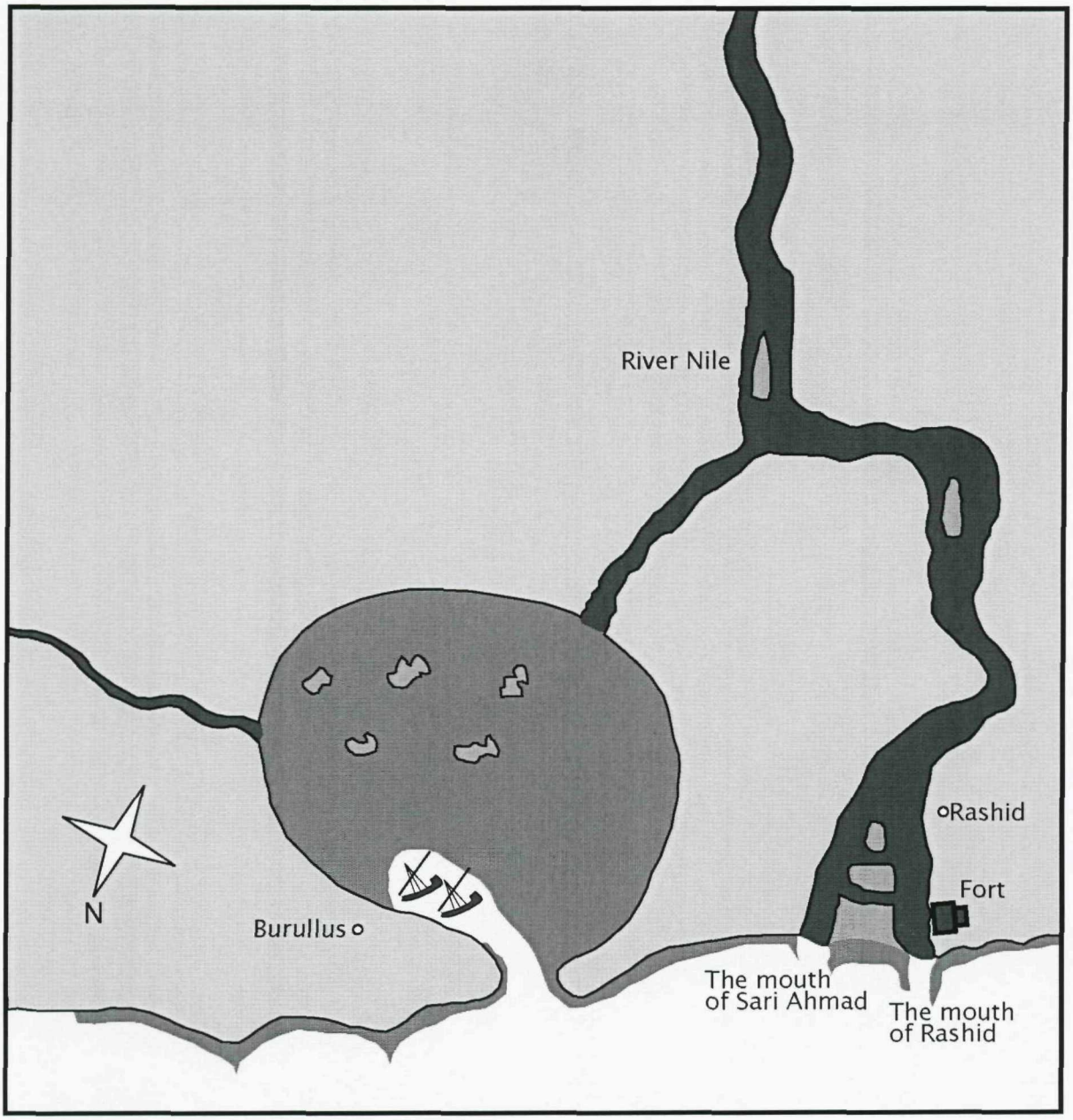


Figure 26: Lake Burullus and the Rashid branch, after Piri Reis (*Bahriye*) (1513).

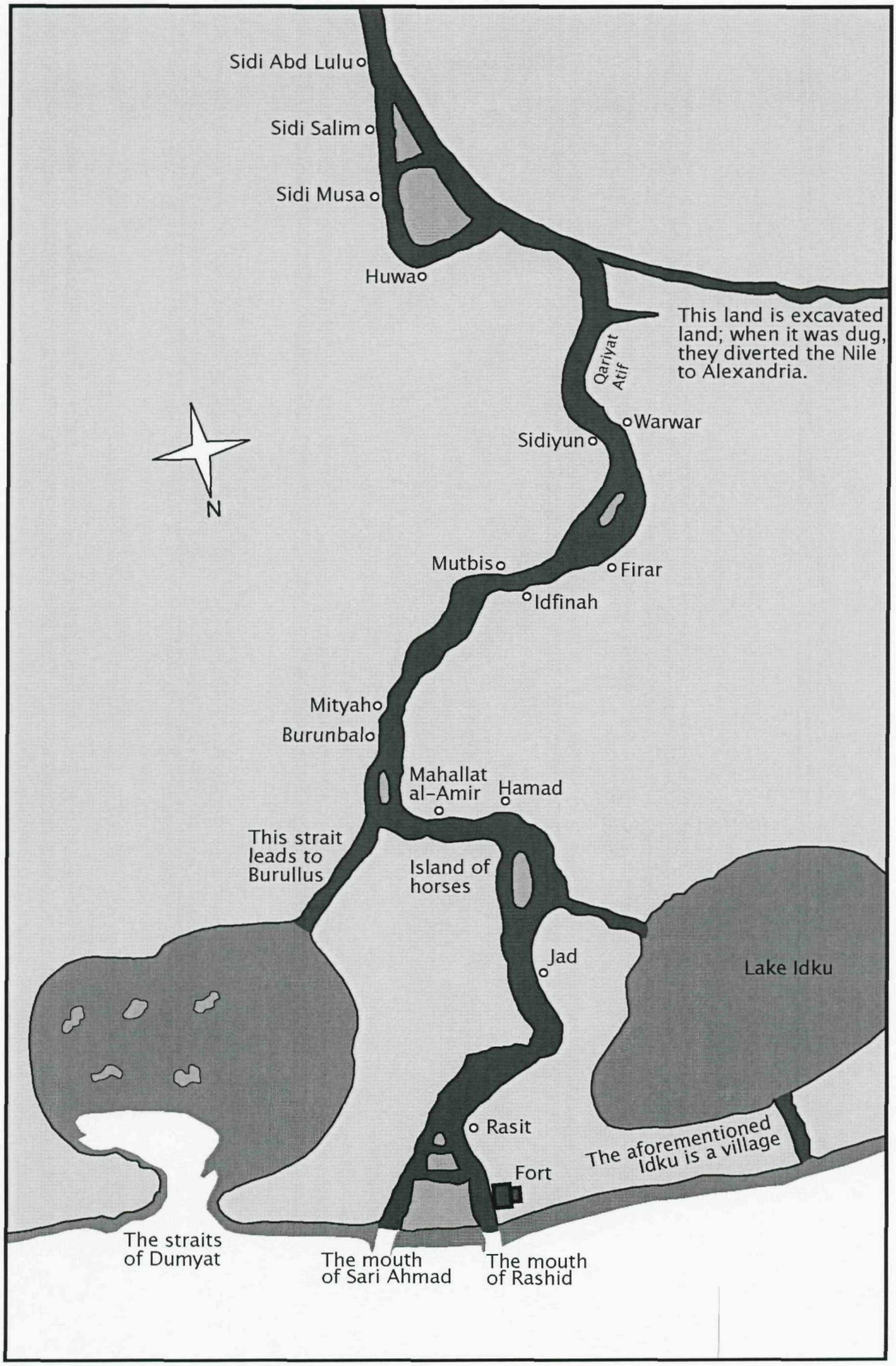


Figure 27: The Rashid branch and Lakes Burullus and Idku, after Piri Reis (*Bahriye*) (1513).

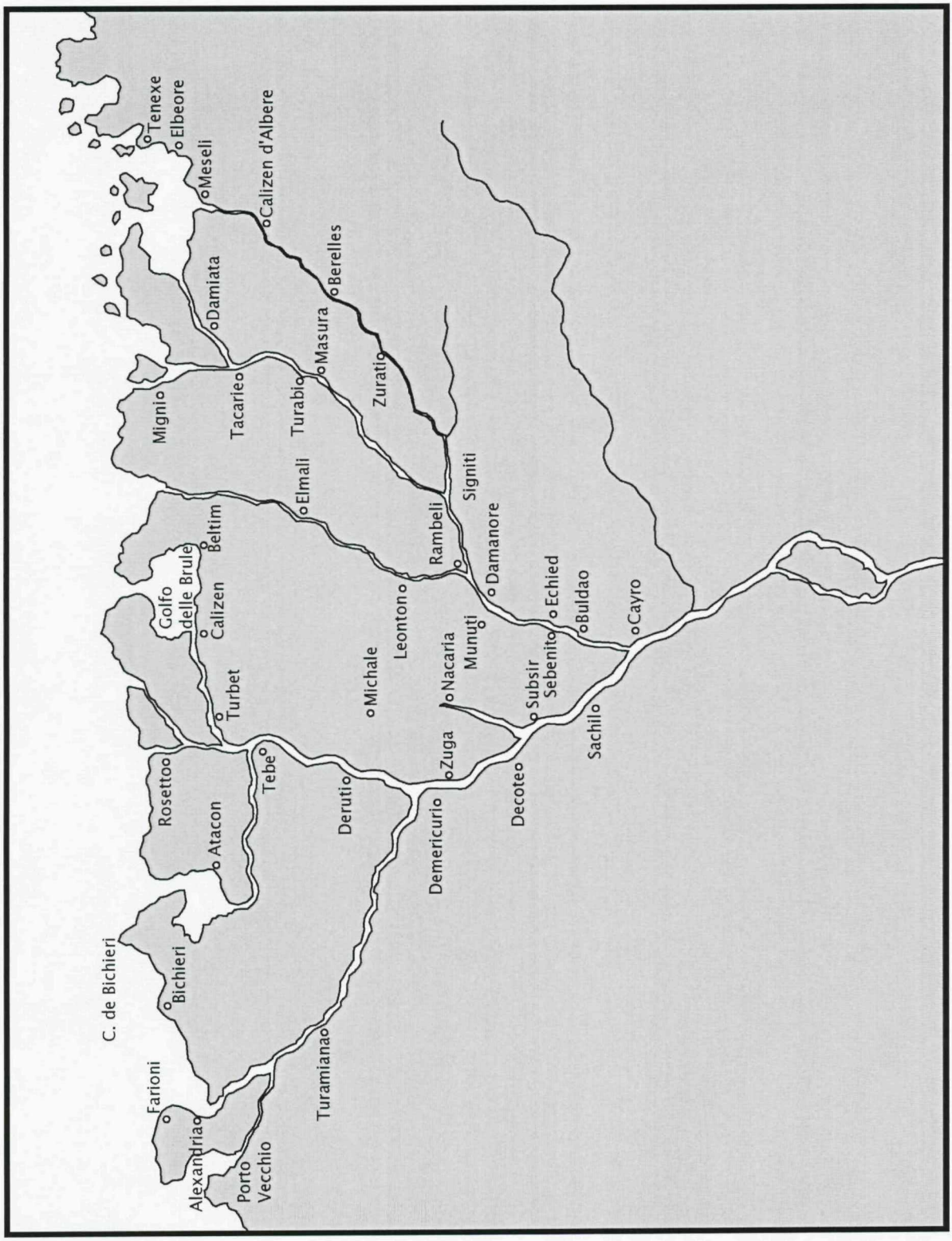


Figure 28: The Nile Delta after Forlani, (1566).

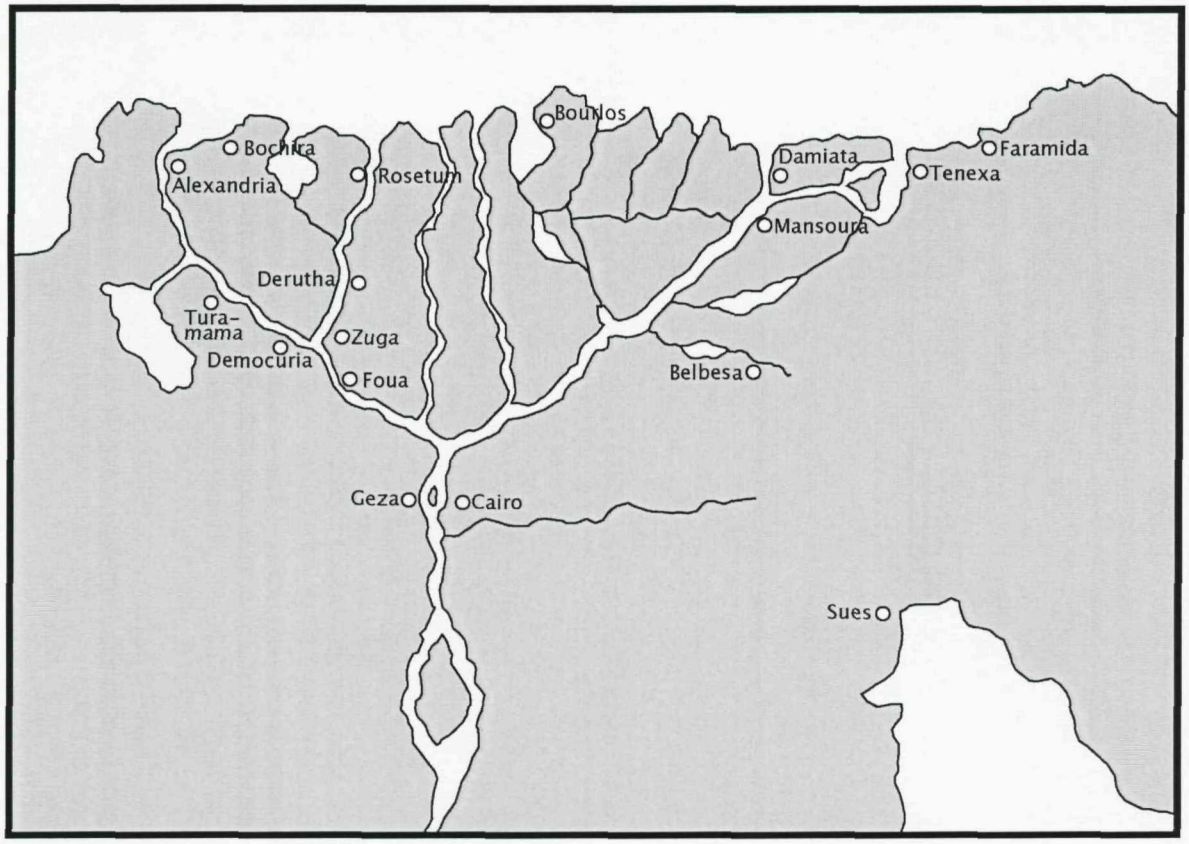


Figure 29: The Nile Delta after d'Abbeville, (1655).

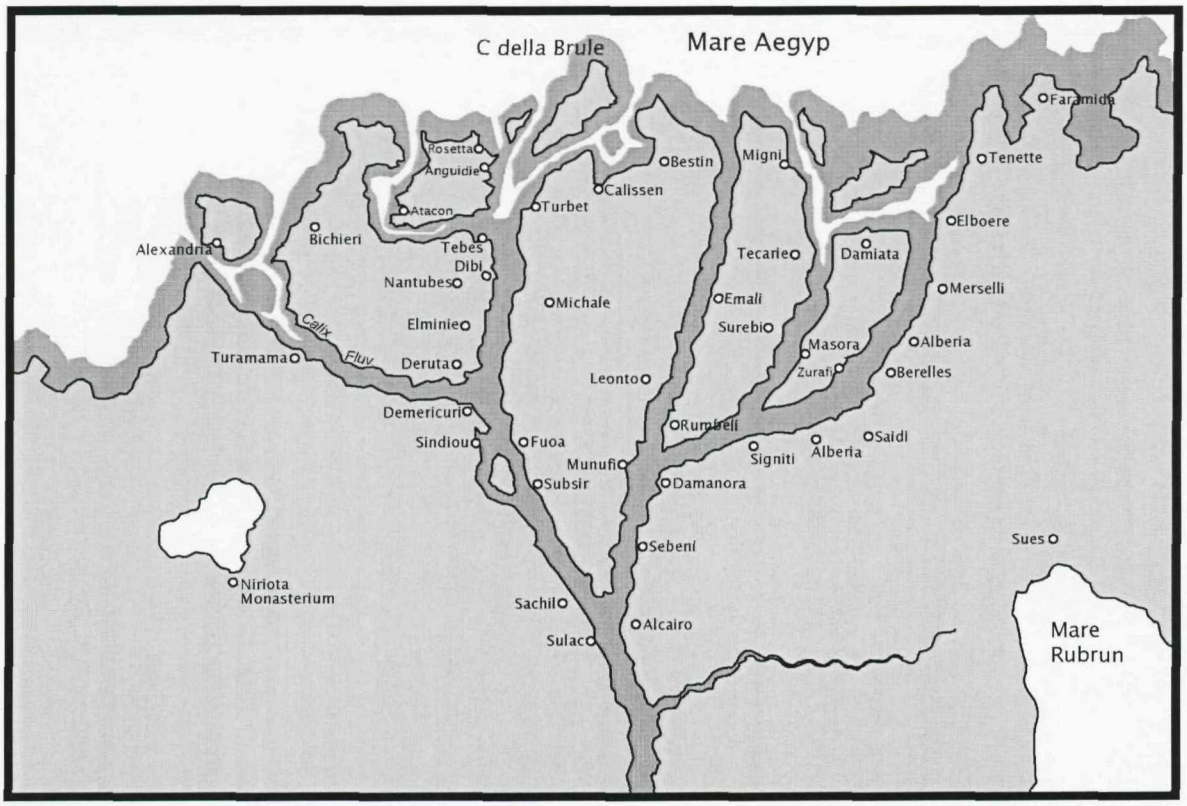


Figure 30: The Nile Delta, after Blaeu (1665).

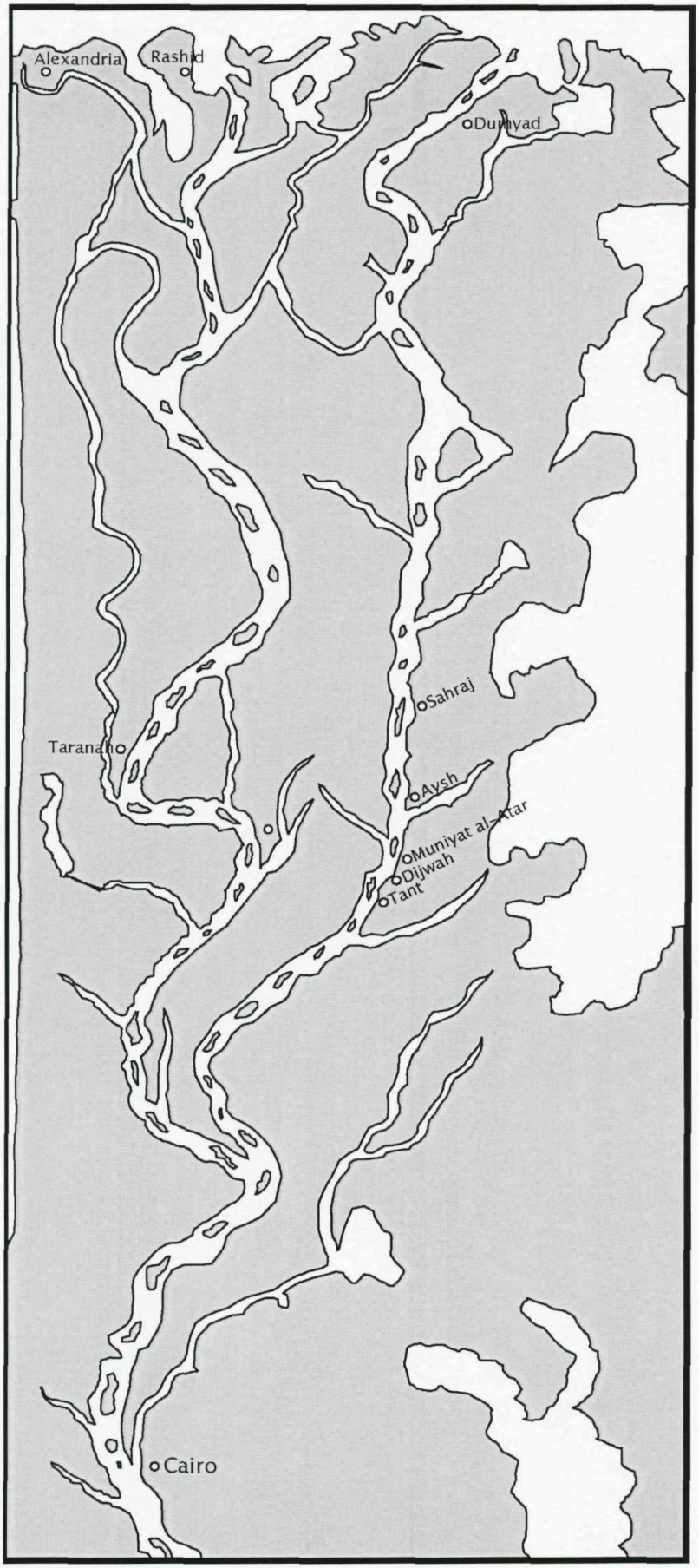


Figure 31: The Nile Delta, after Evliya Celebi, c.1682.

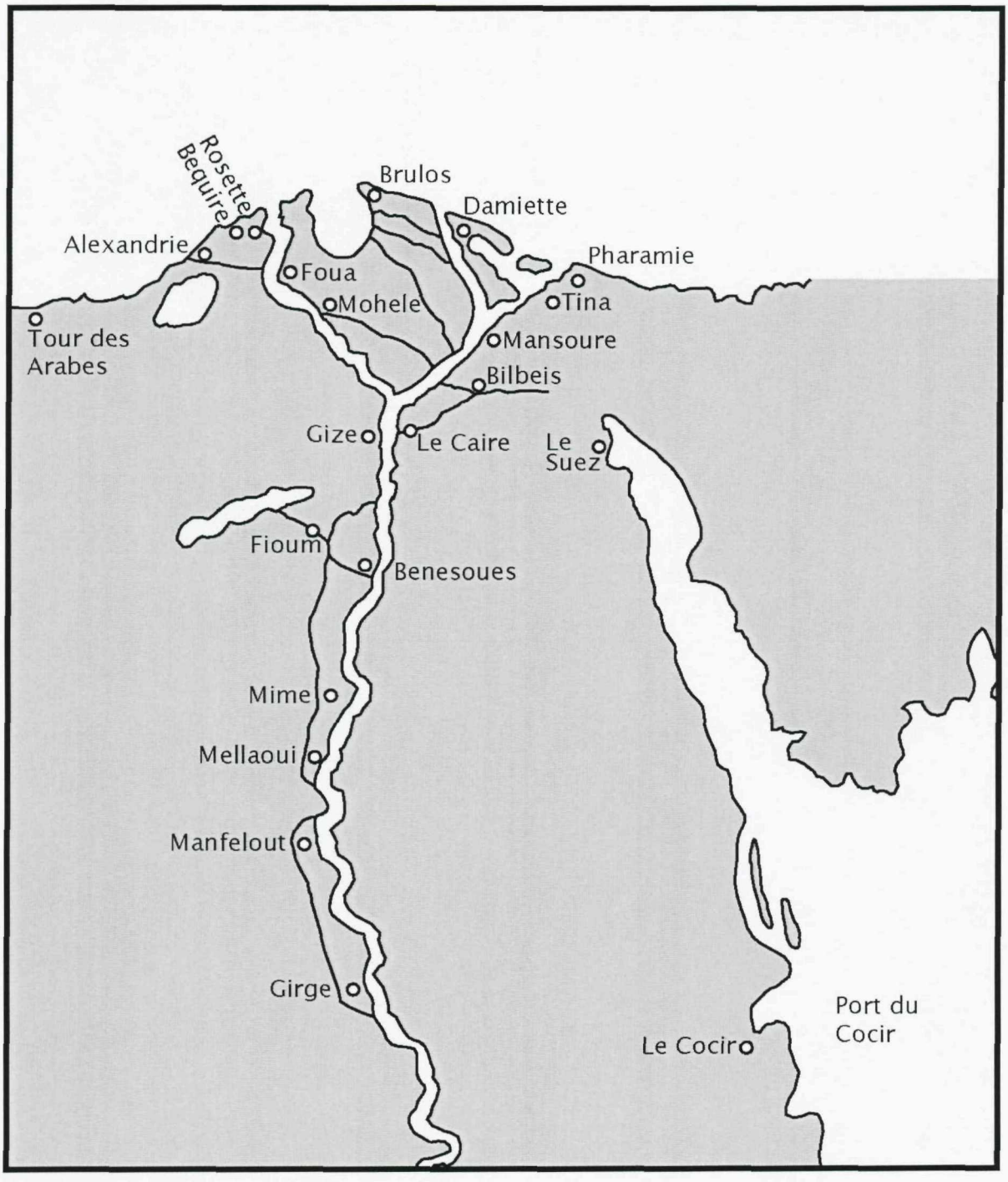


Figure 32: The Nile Delta after De l'Isle (1707).

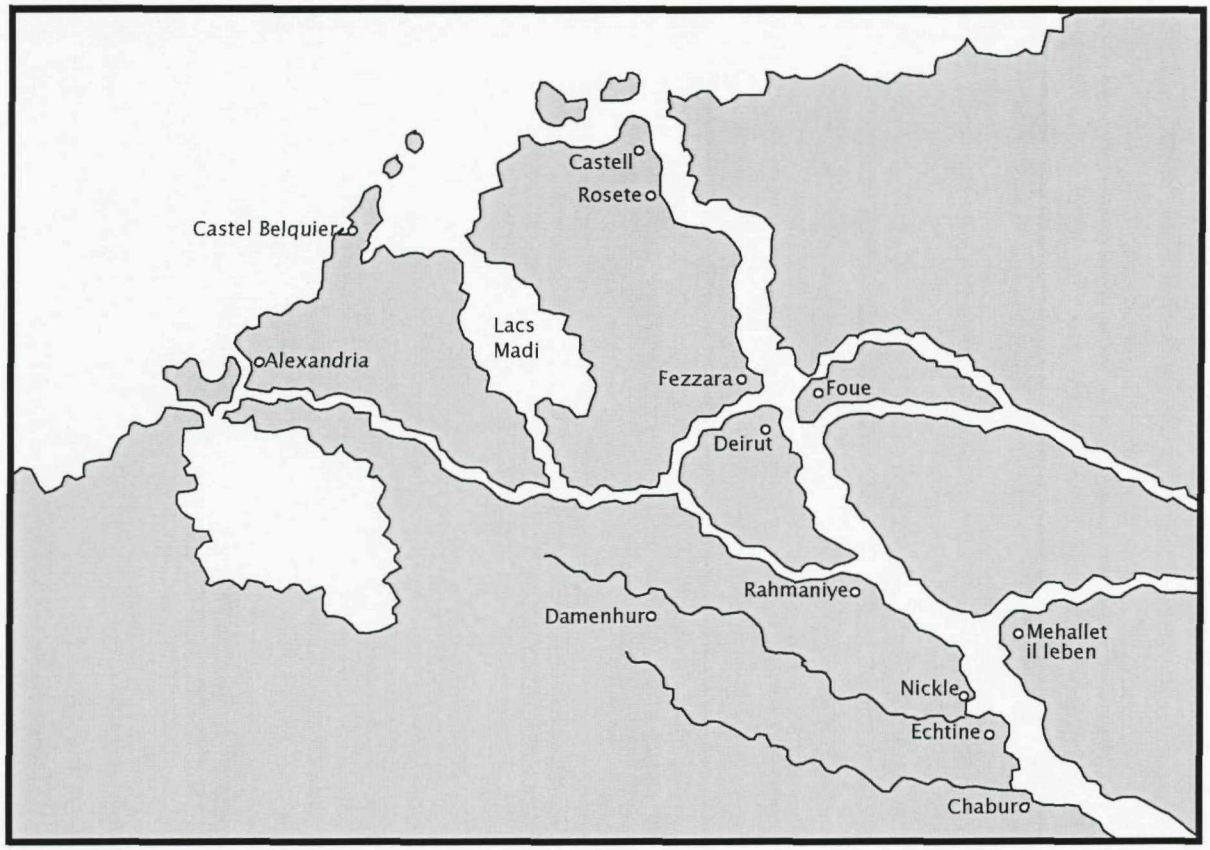


Figure 33: The western Nile Delta after Homann (1715).

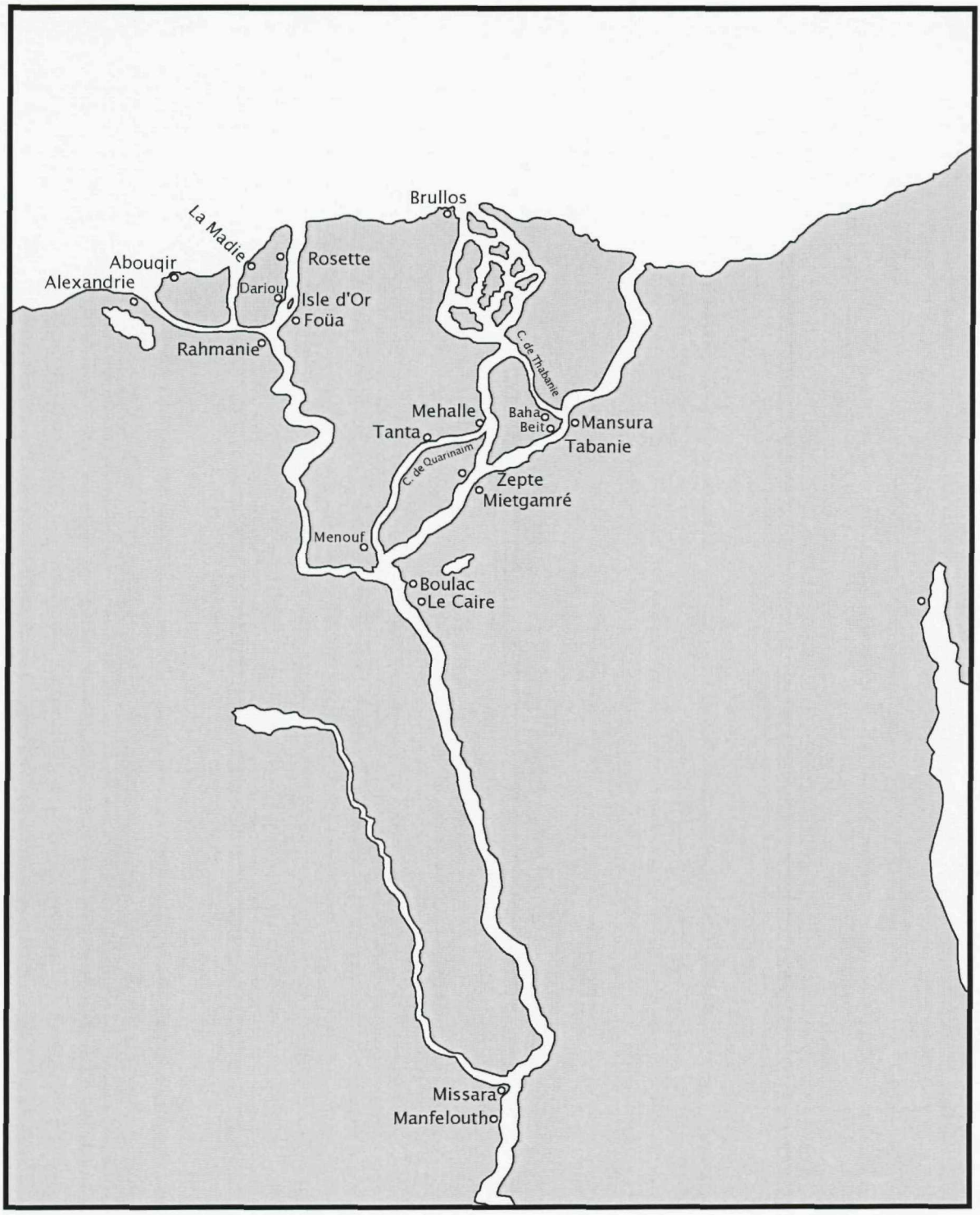


Figure 34: The Egyptian Nile, after de Fer (1720).

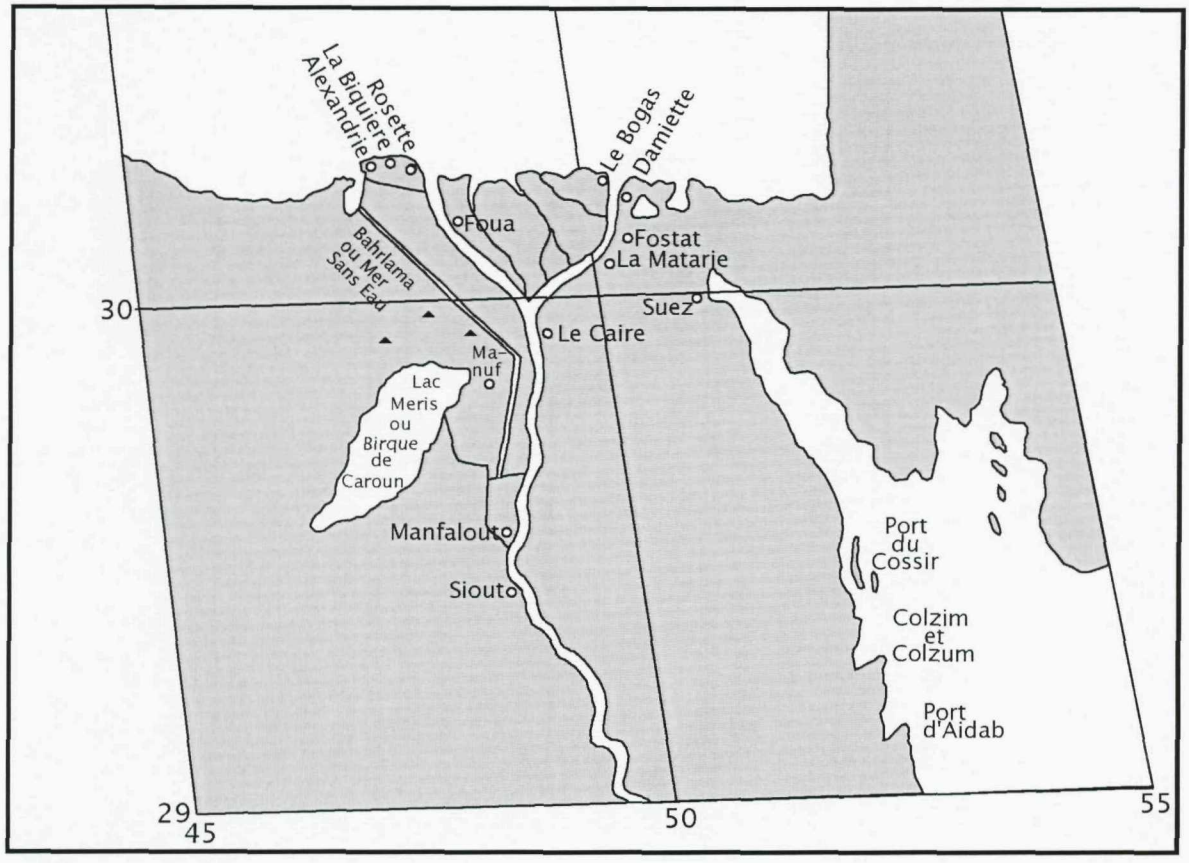


Figure 35: The Egyptian Nile, after Maillet (1740).

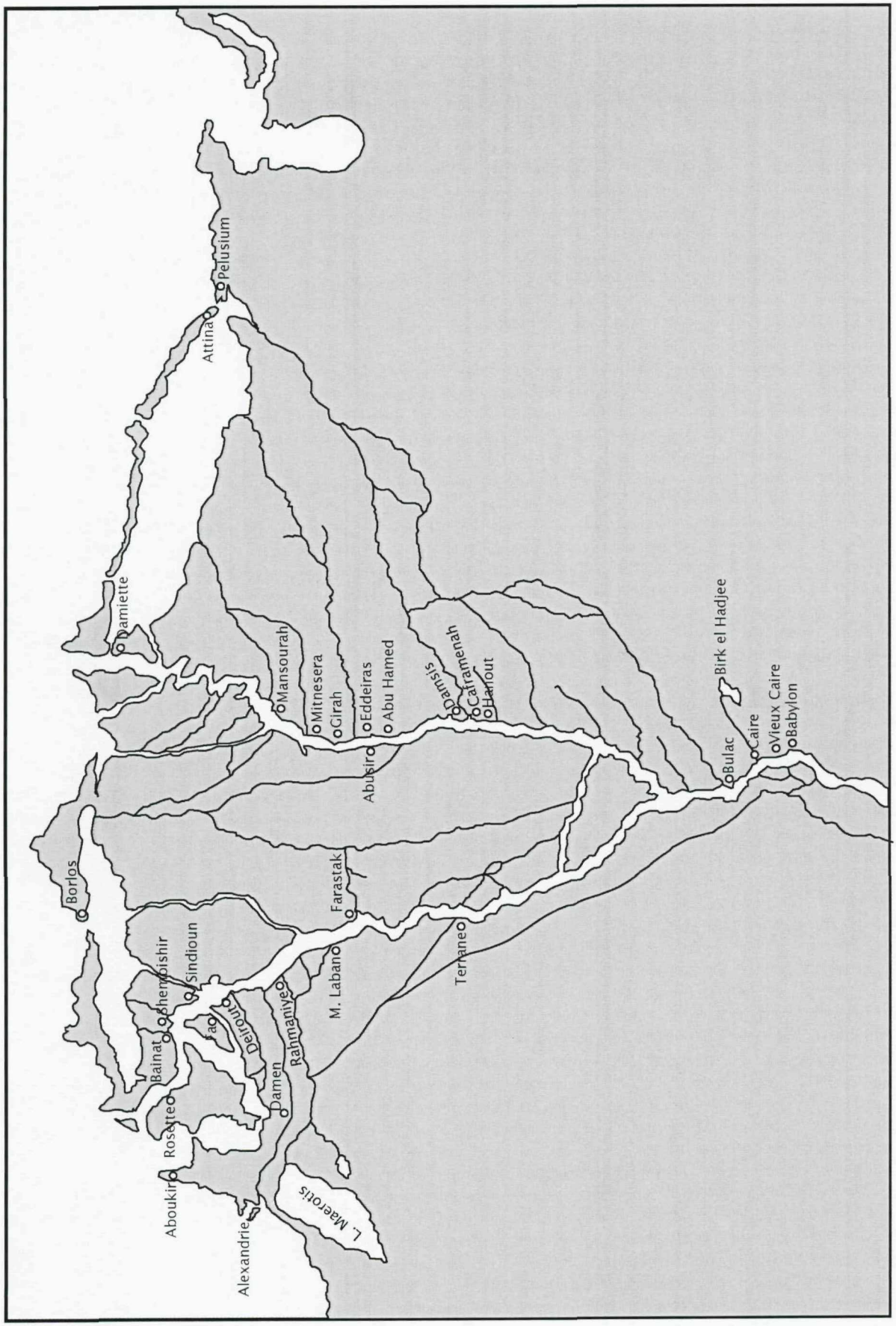


Figure 36: The Nile Delta after Sicard *et al* (1753).

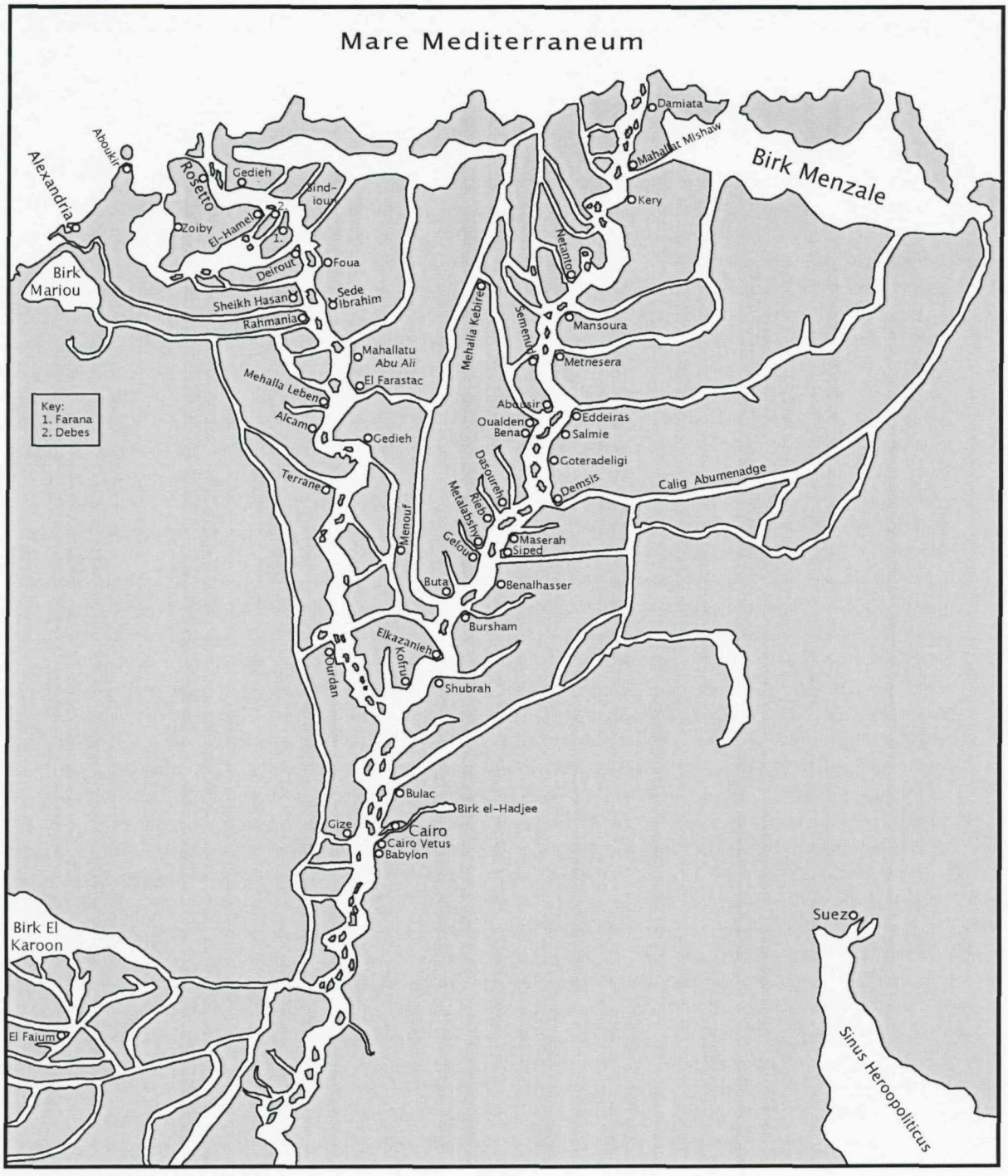


Figure 37: The Nile Delta after Pococke (1763). Pococke's map appears to draw heavily on that of Sicard et al (1753).

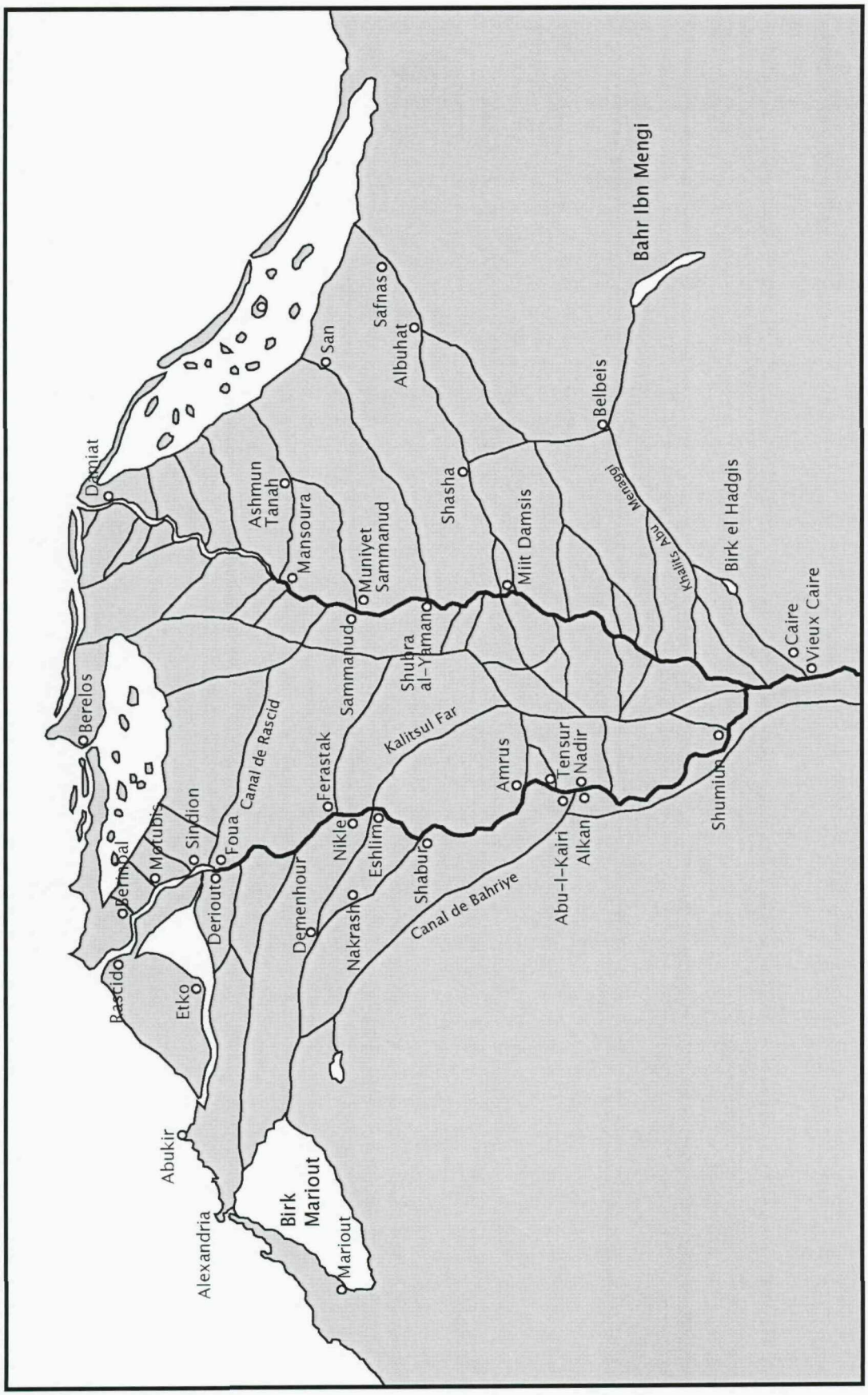


Figure 38: The Nile Delta after d'Anville (1765).

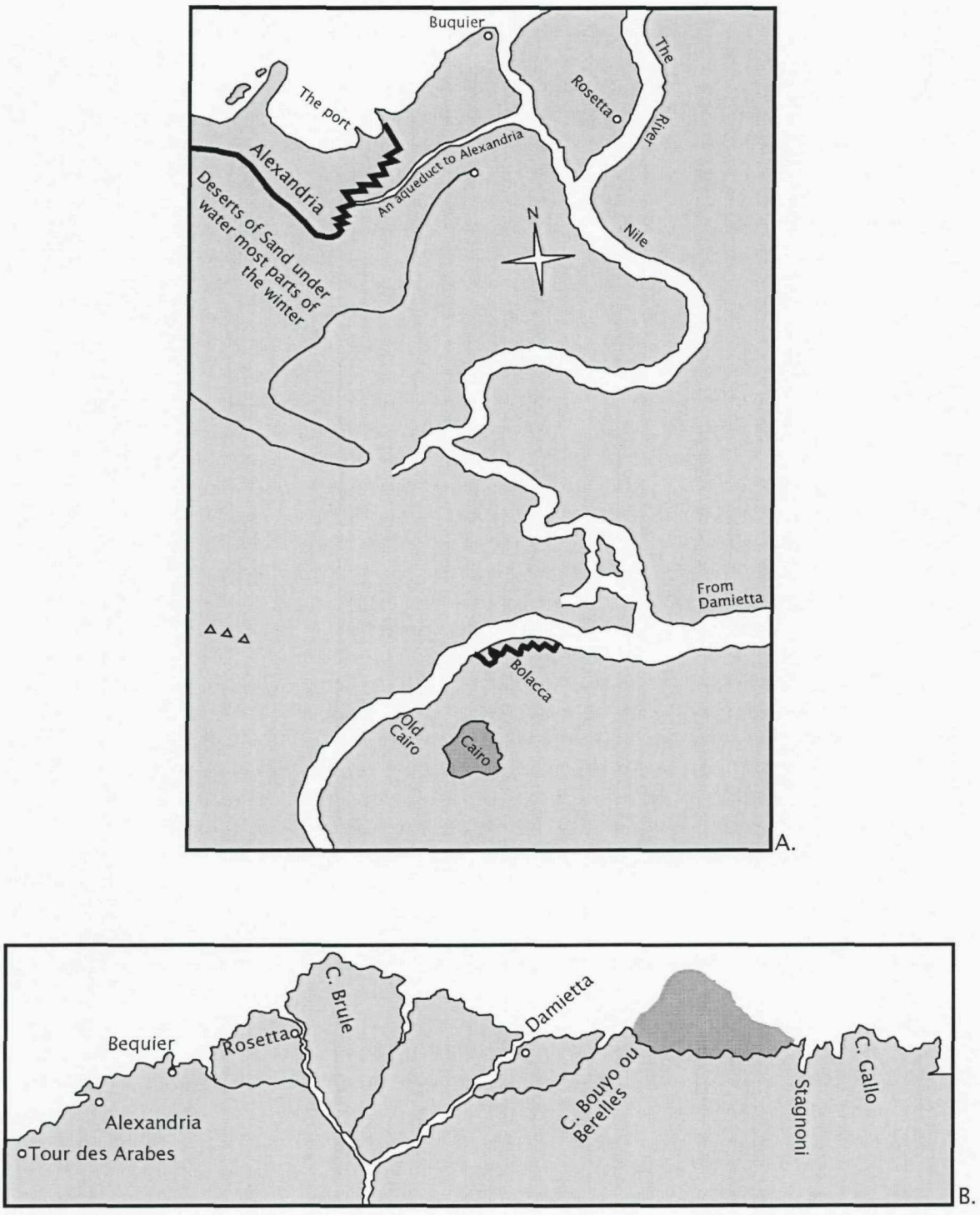


Figure 39: The western Nile Delta (A.) and a general view of the Nile Delta (B.) after the *Chart of the Mediterranean Sea* (1790).

Appendix 2: Locator maps

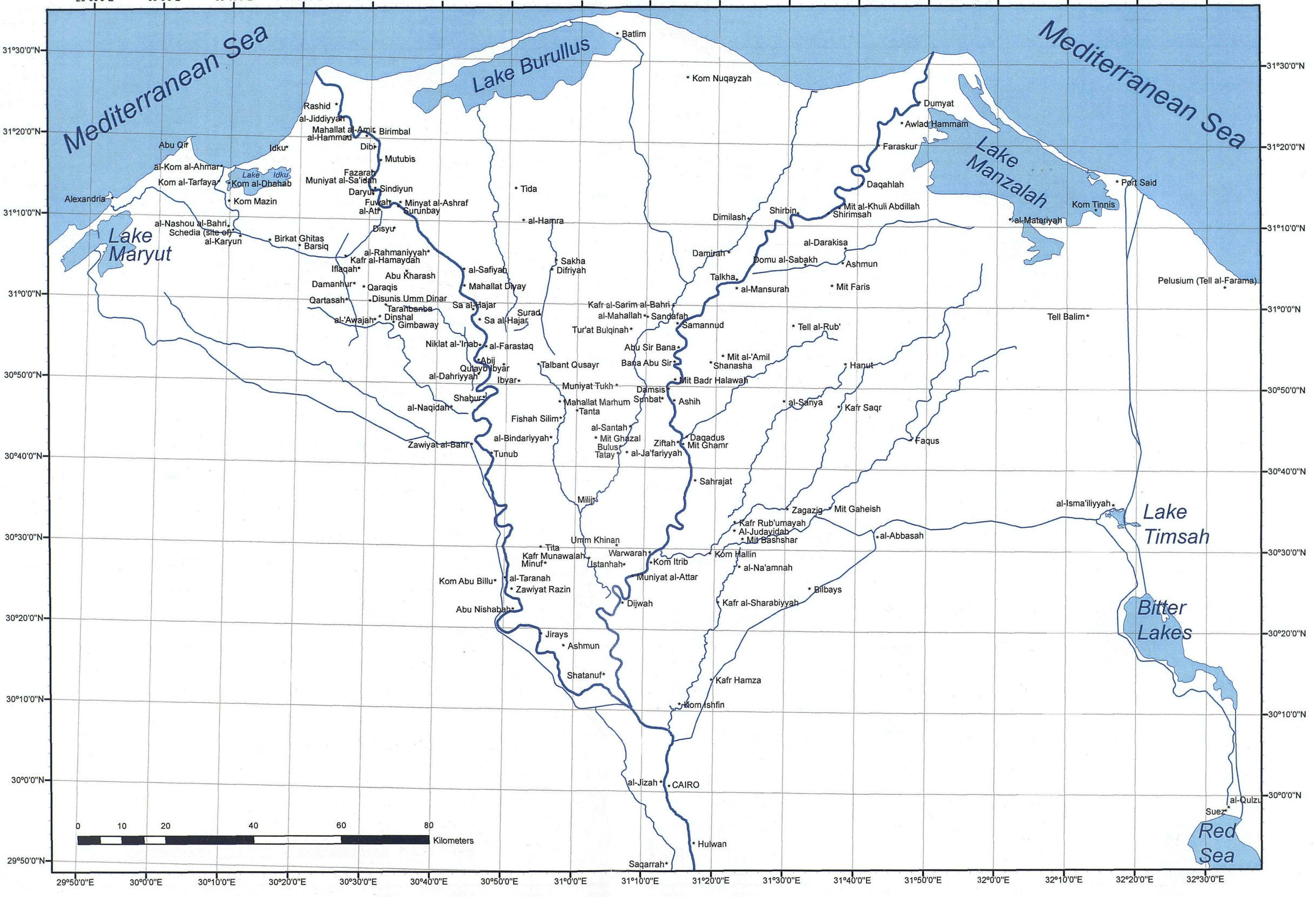


Figure 1: Map of the modern Nile Delta showing modern place-names referred to in the text. The rivers and canals depicted on this map are labelled on Figure 2.

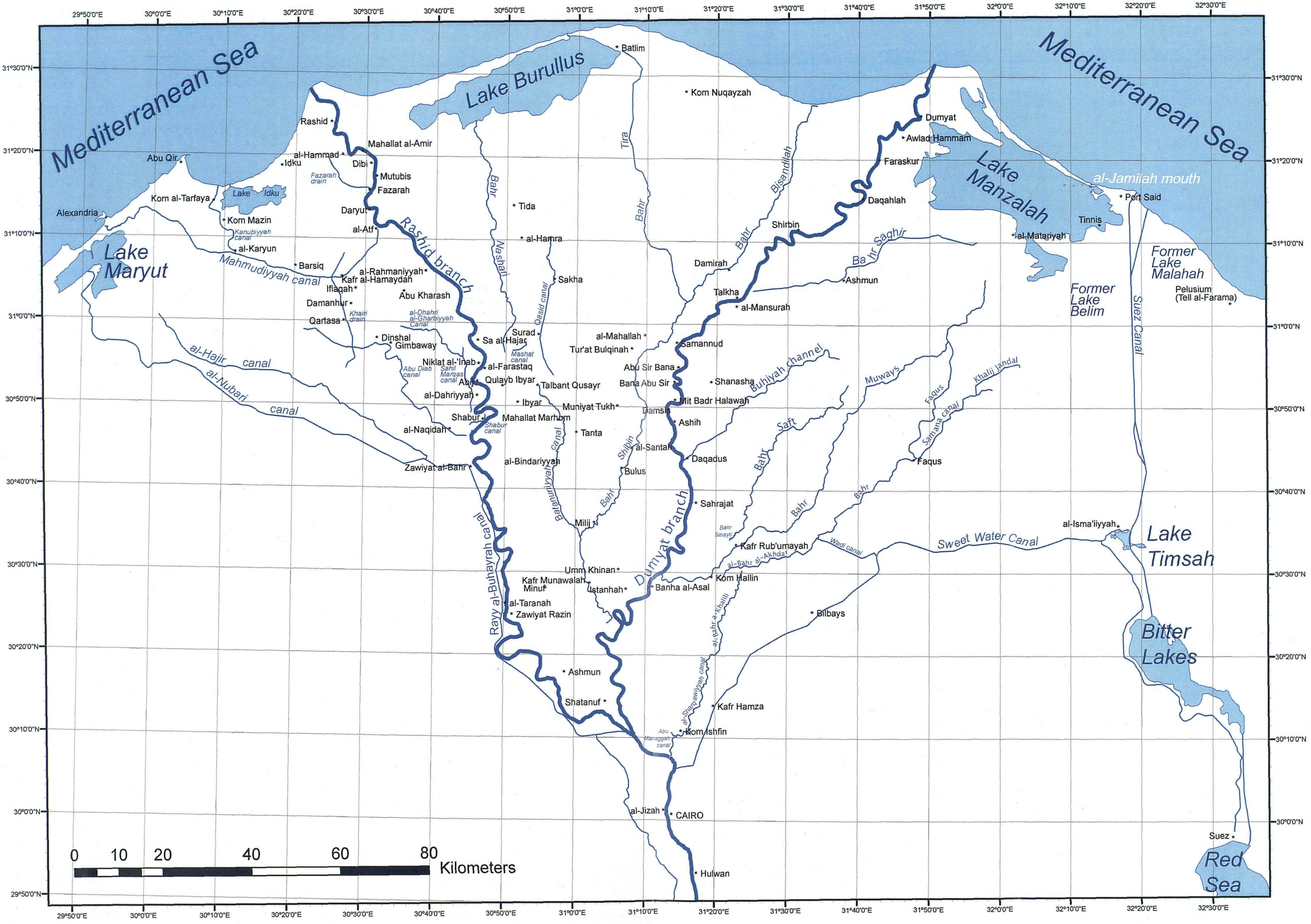


Figure 2: Map of the modern Nile Delta showing modern waterways referred to in the text (only depicting sections relevant to the dicussion).
The modern place names mentioned in the text are shown in Figure 1 of this appendix.

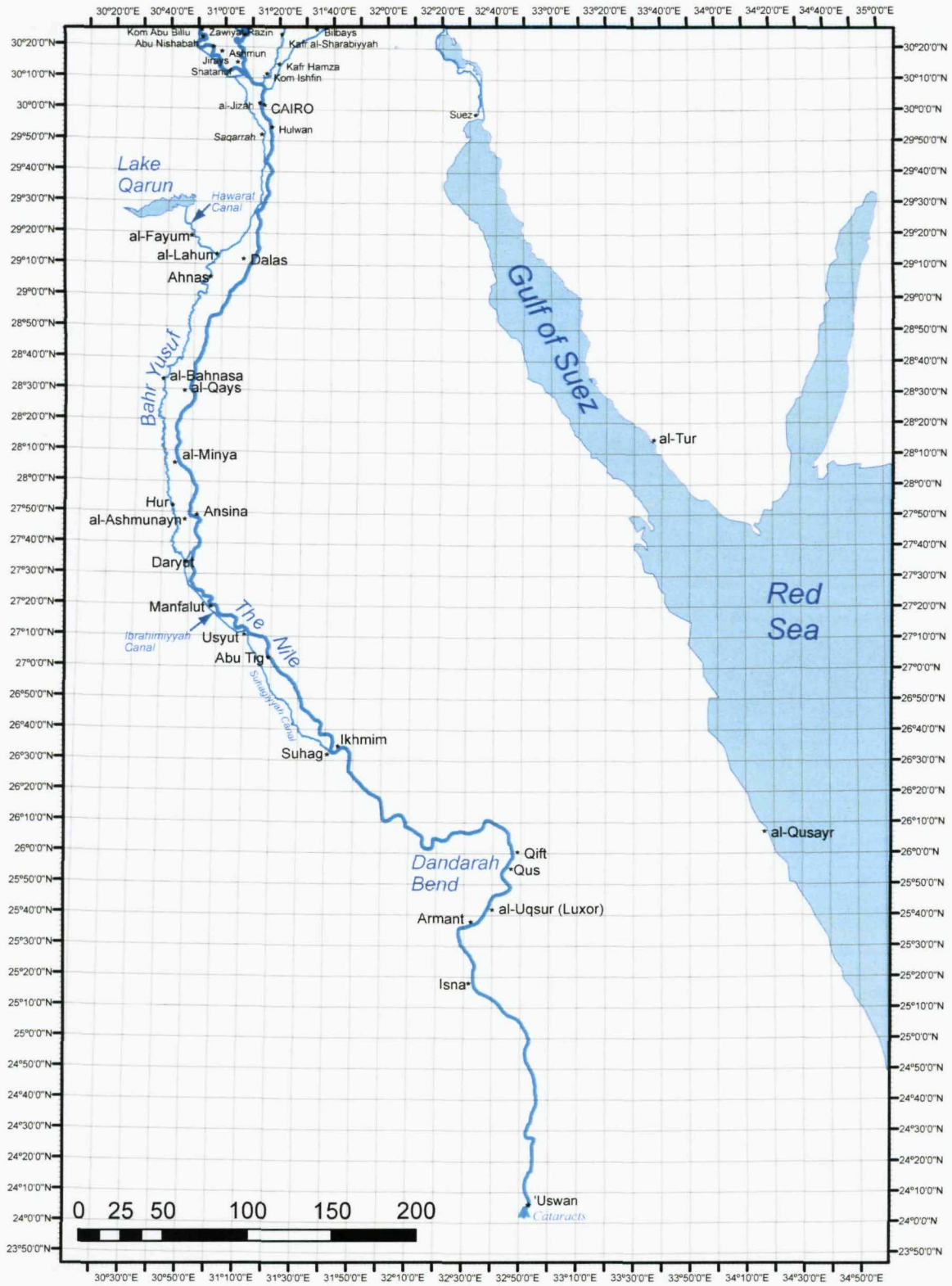


Figure 3: Map of the modern Nile valley, showing modern places and waterways referred to in the text.

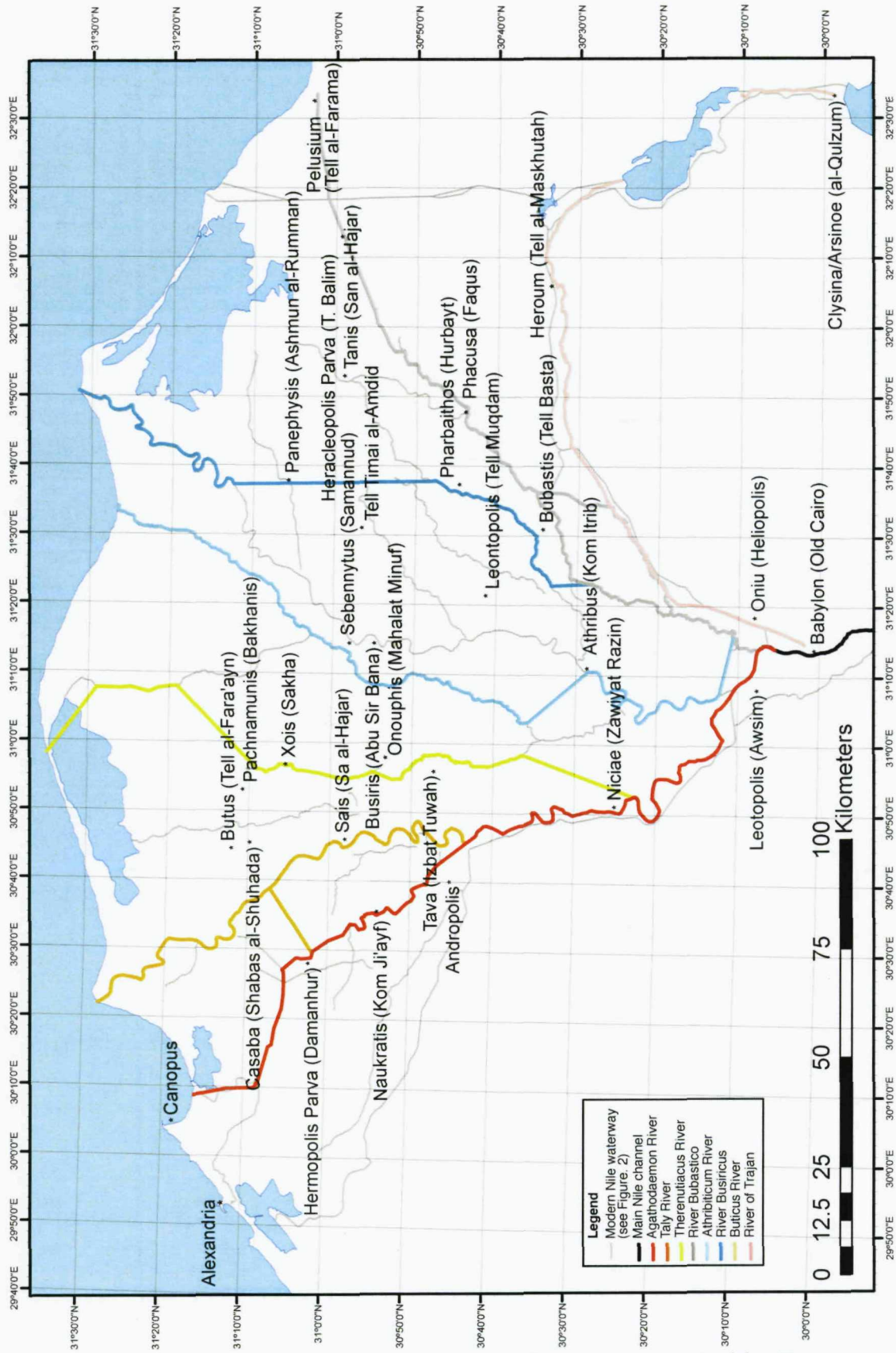


Figure 4: Ptolemy's description of the Nile Delta, as interpreted by Toussoun (1925; pl IX). The fine grey lines indicate modern waterways (see Figure 2)

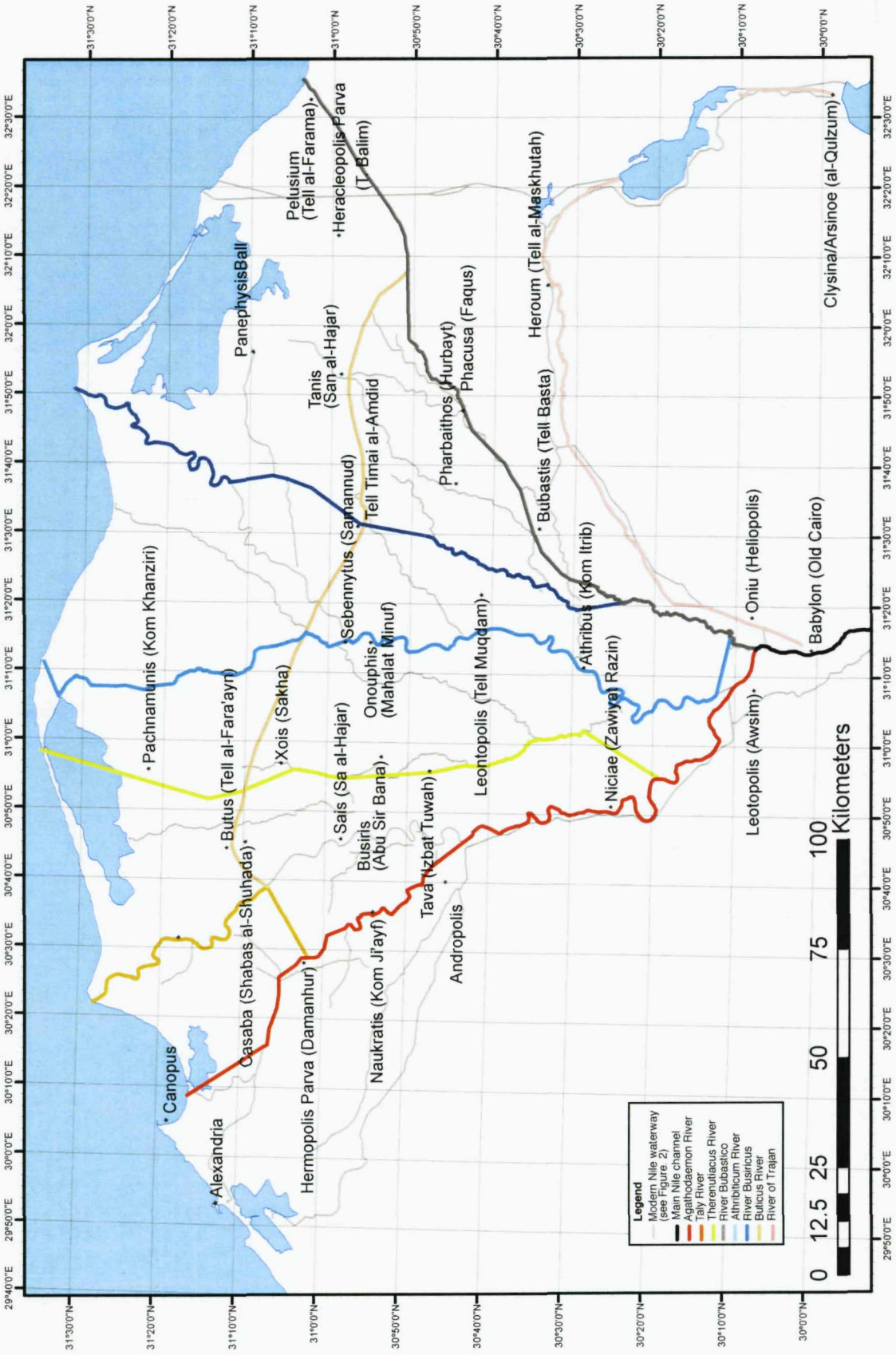


Figure 5: Ptolemy's description of the Nile Delta, as interpreted by Ball (1942: 120).

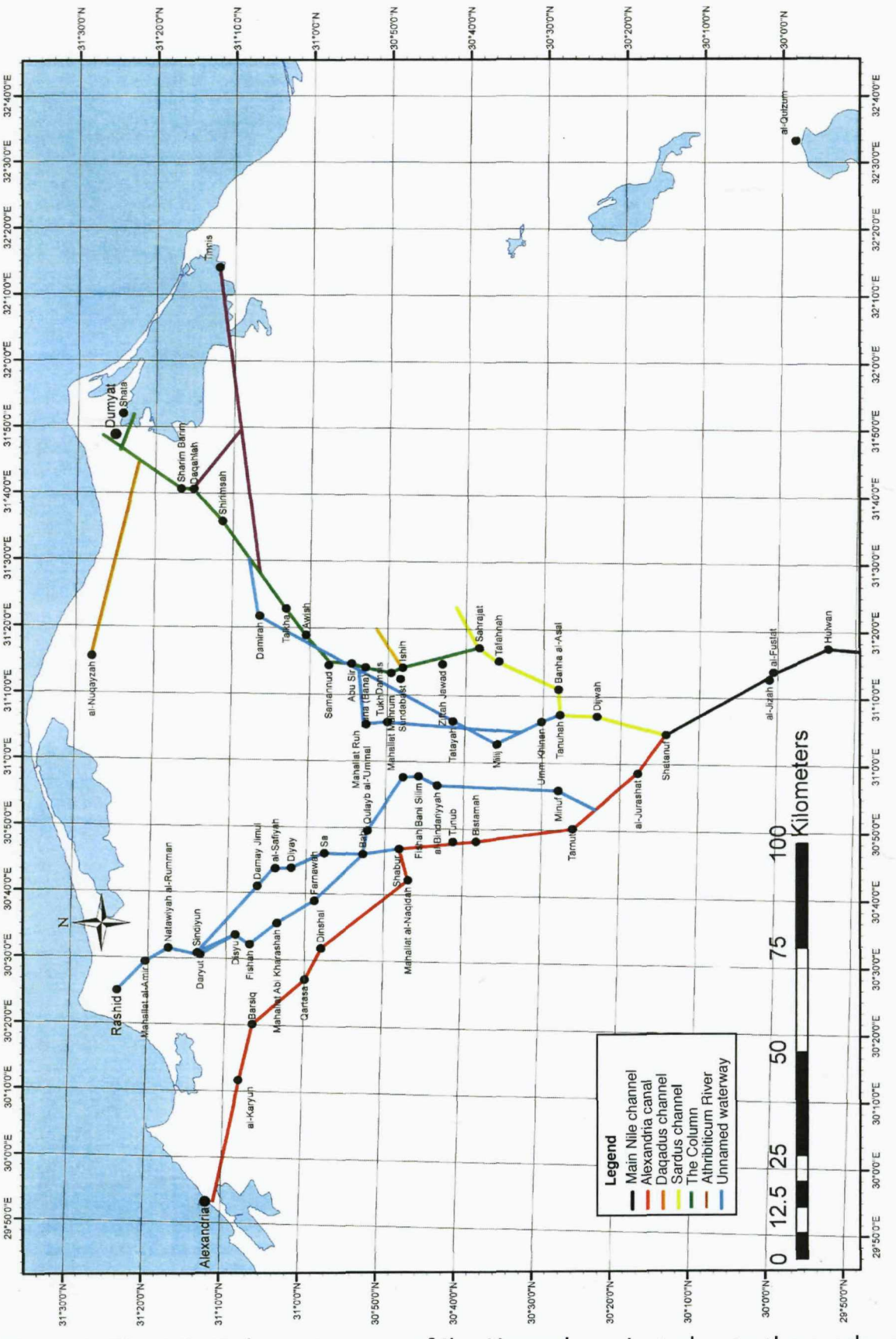


Figure 6: The Nile Delta waterways of Ibn Hawqal, projected onto the modern Delta using the place-names he provides.

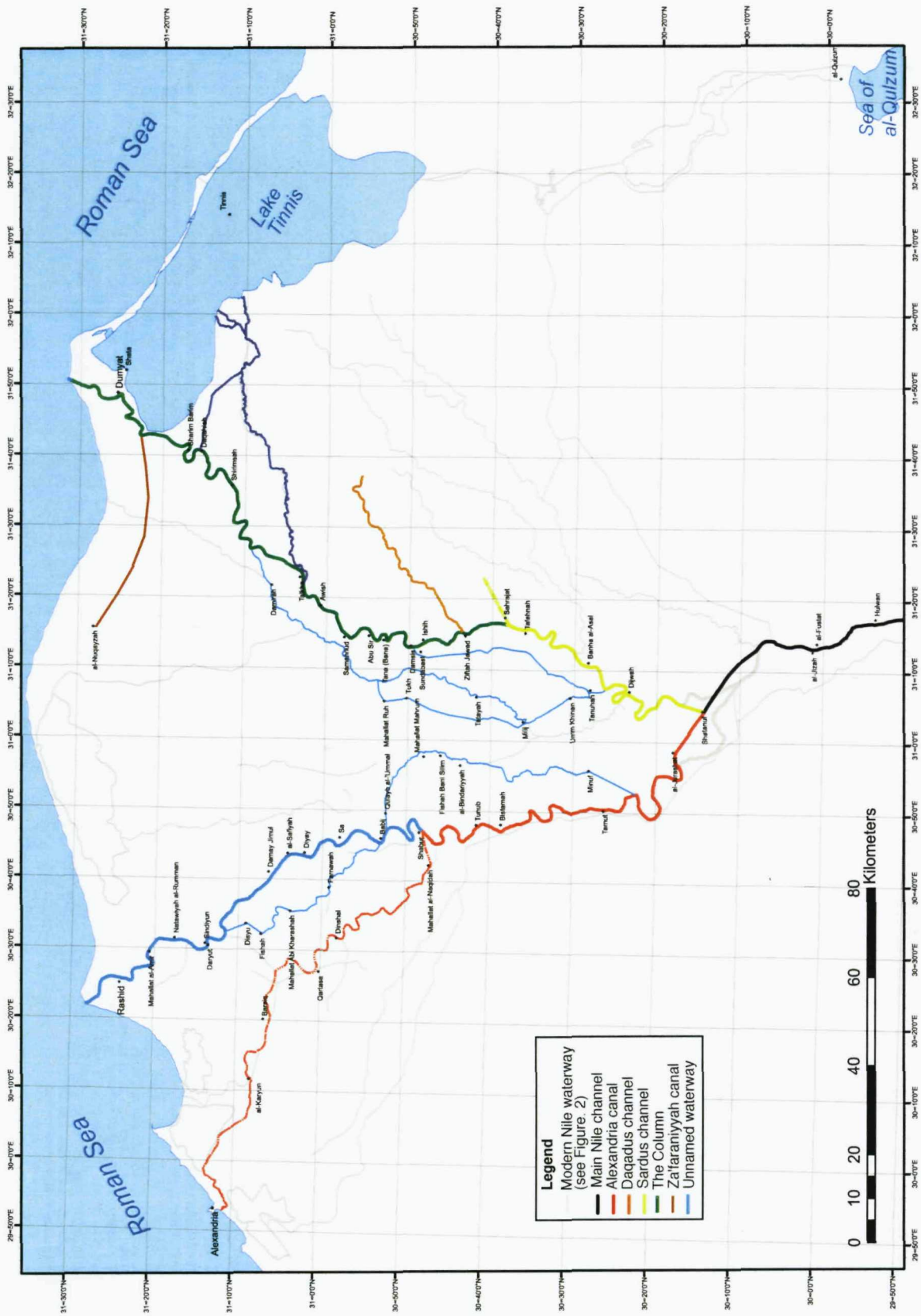


Figure 7: The Nile Delta according to Ibn Hawqal, after the interpretation arrived at in this thesis.

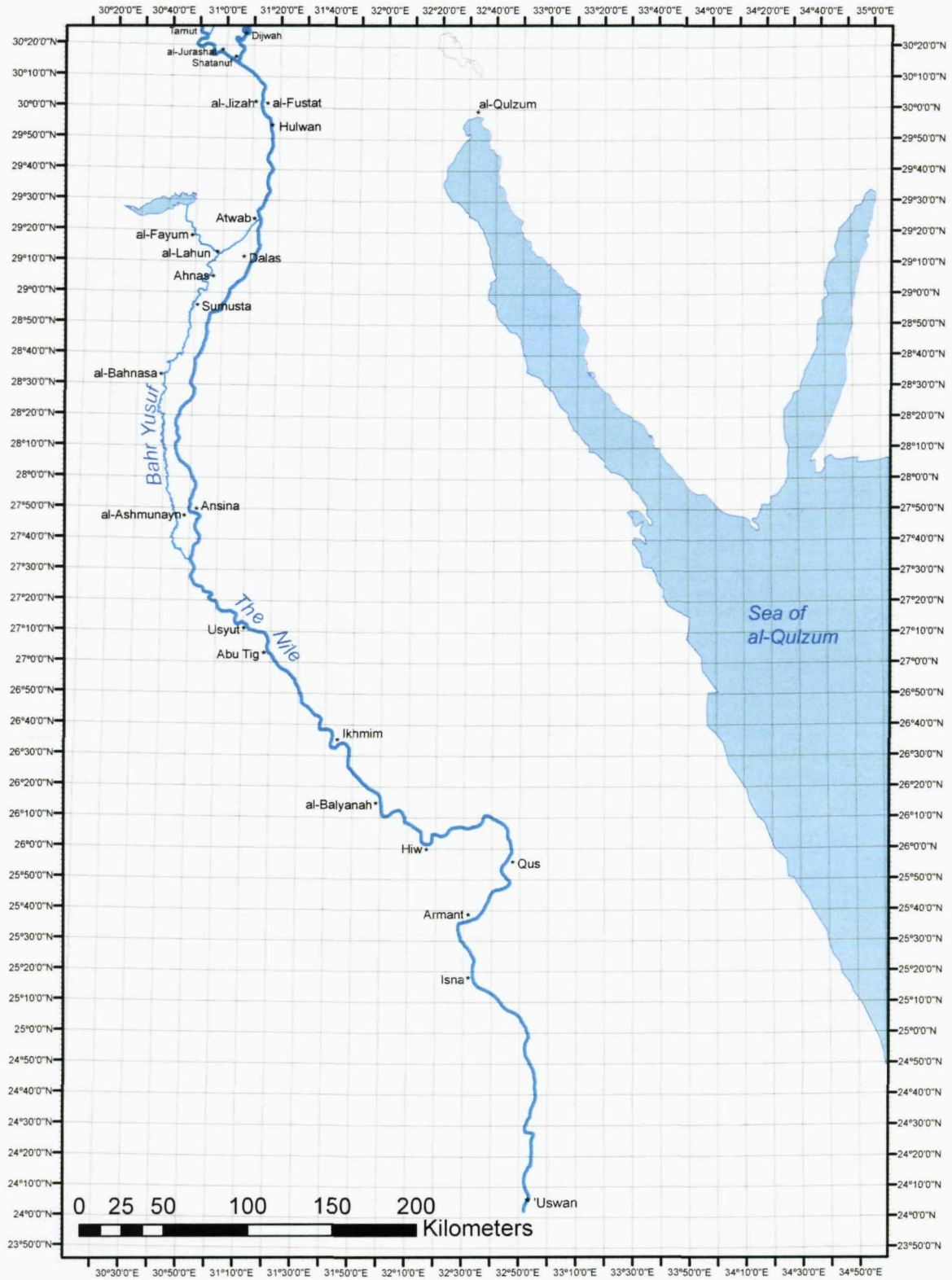


Figure 8: The Nile valley according to Ibn Hawqal, after the interpretation arrived at in this thesis.

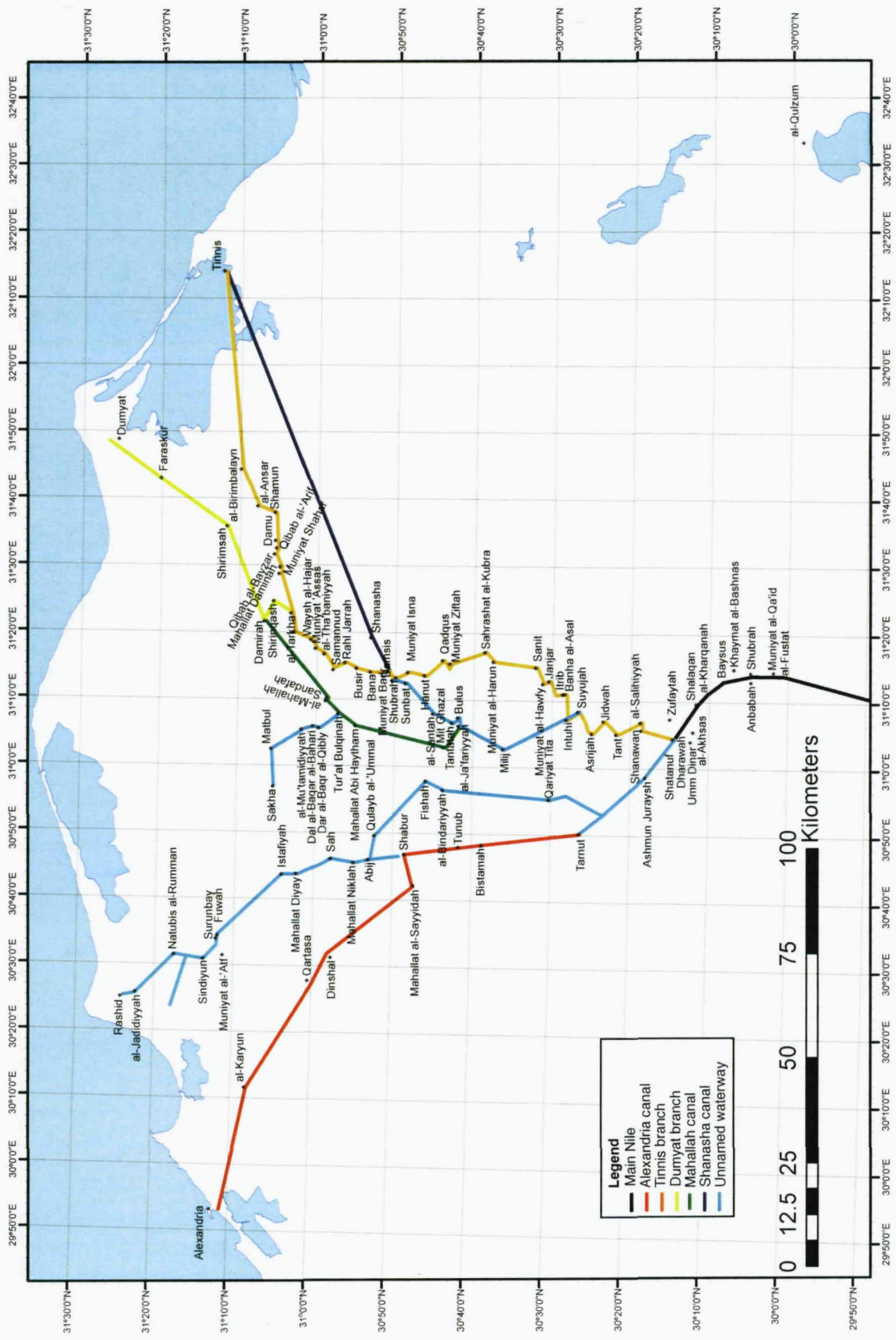


Figure 9: The Nile Delta waterways of a-Idrisi, projected onto the modern Delta using the known place-names he provides.

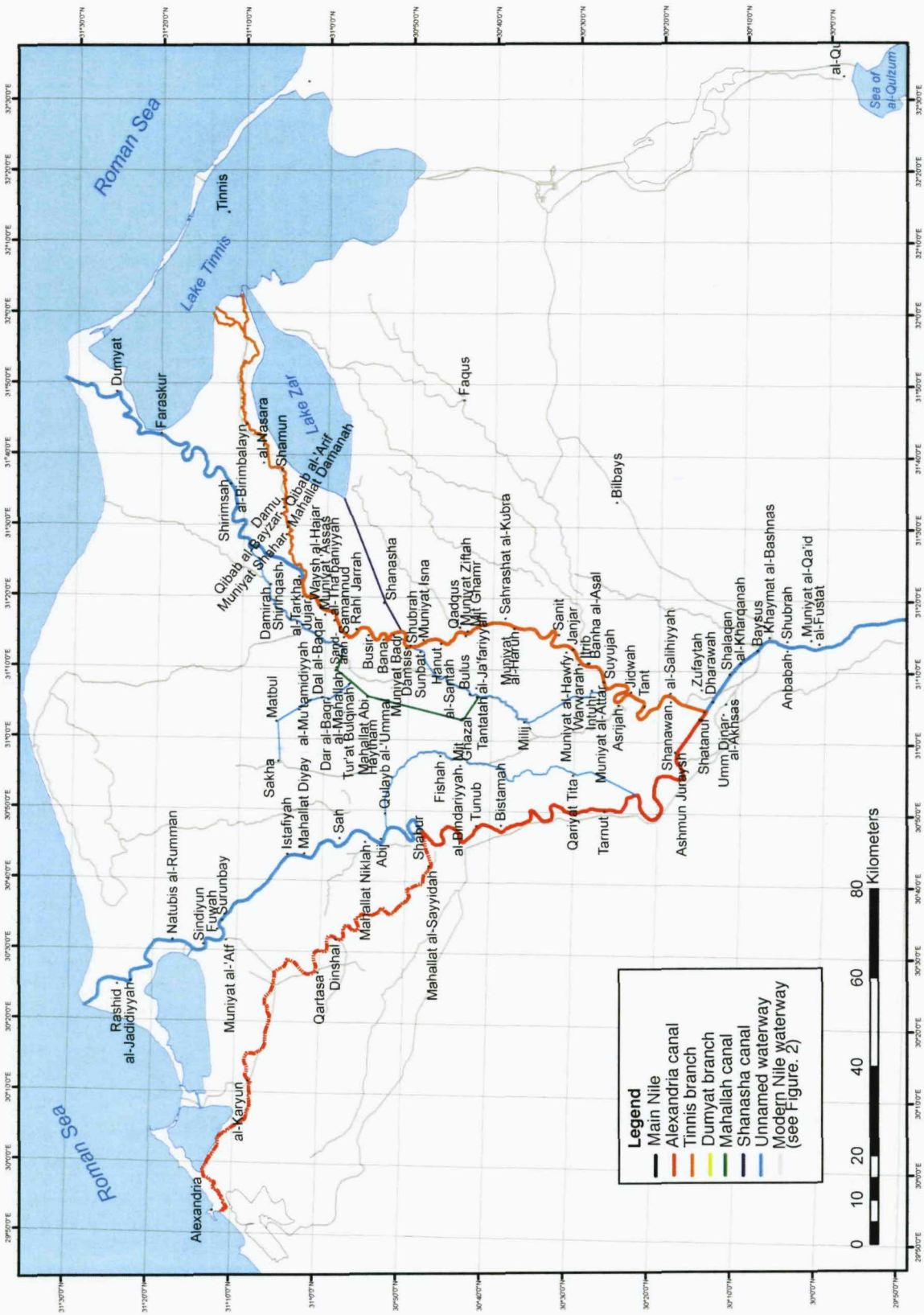


Figure 10: The Nile Delta waterways of a-Idrisi, after the interpretation arrived at in this thesis.

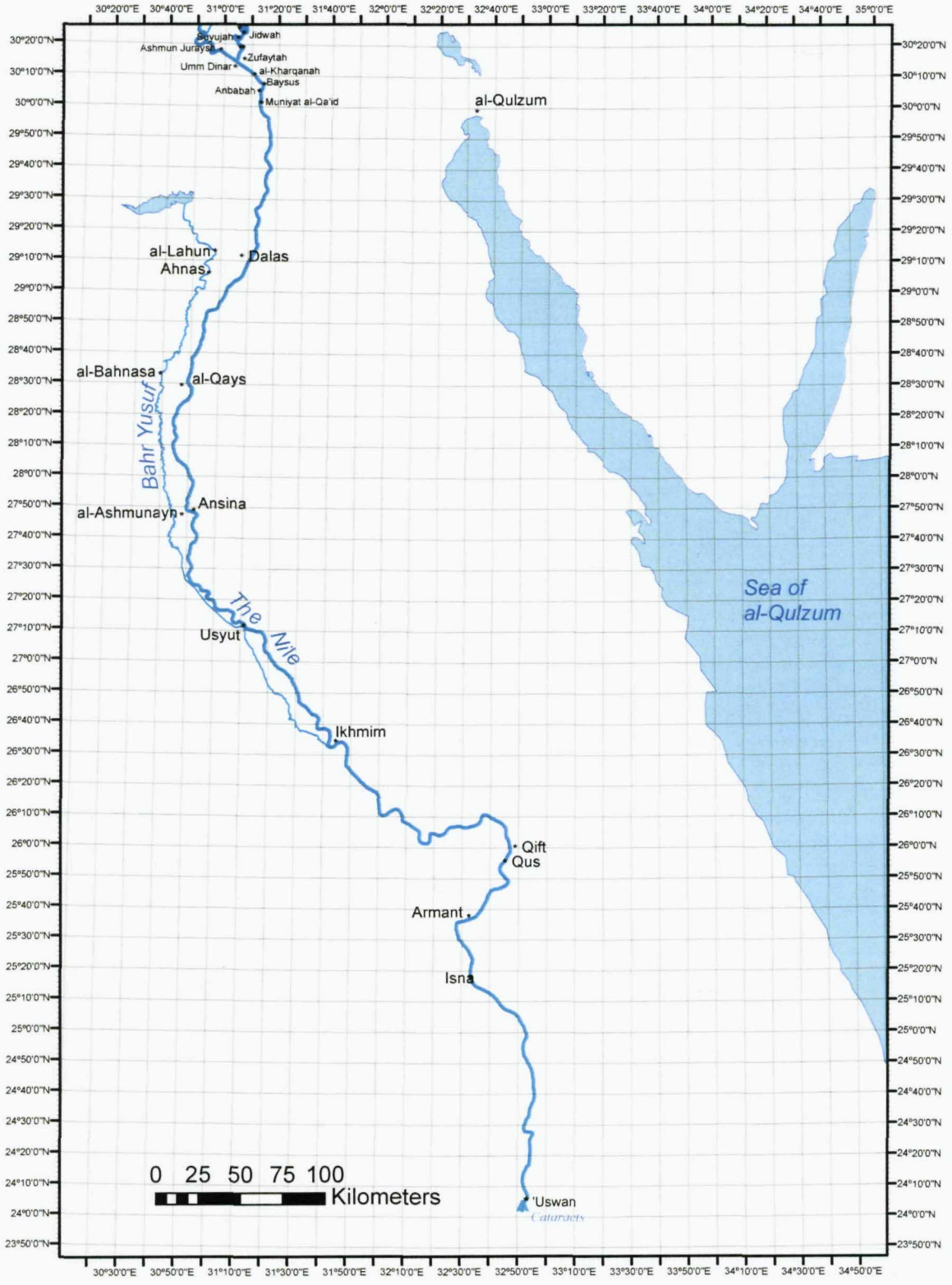


Figure 11: The Nile valley according to al-Idrisi, after the interpretation arrived at in this thesis.

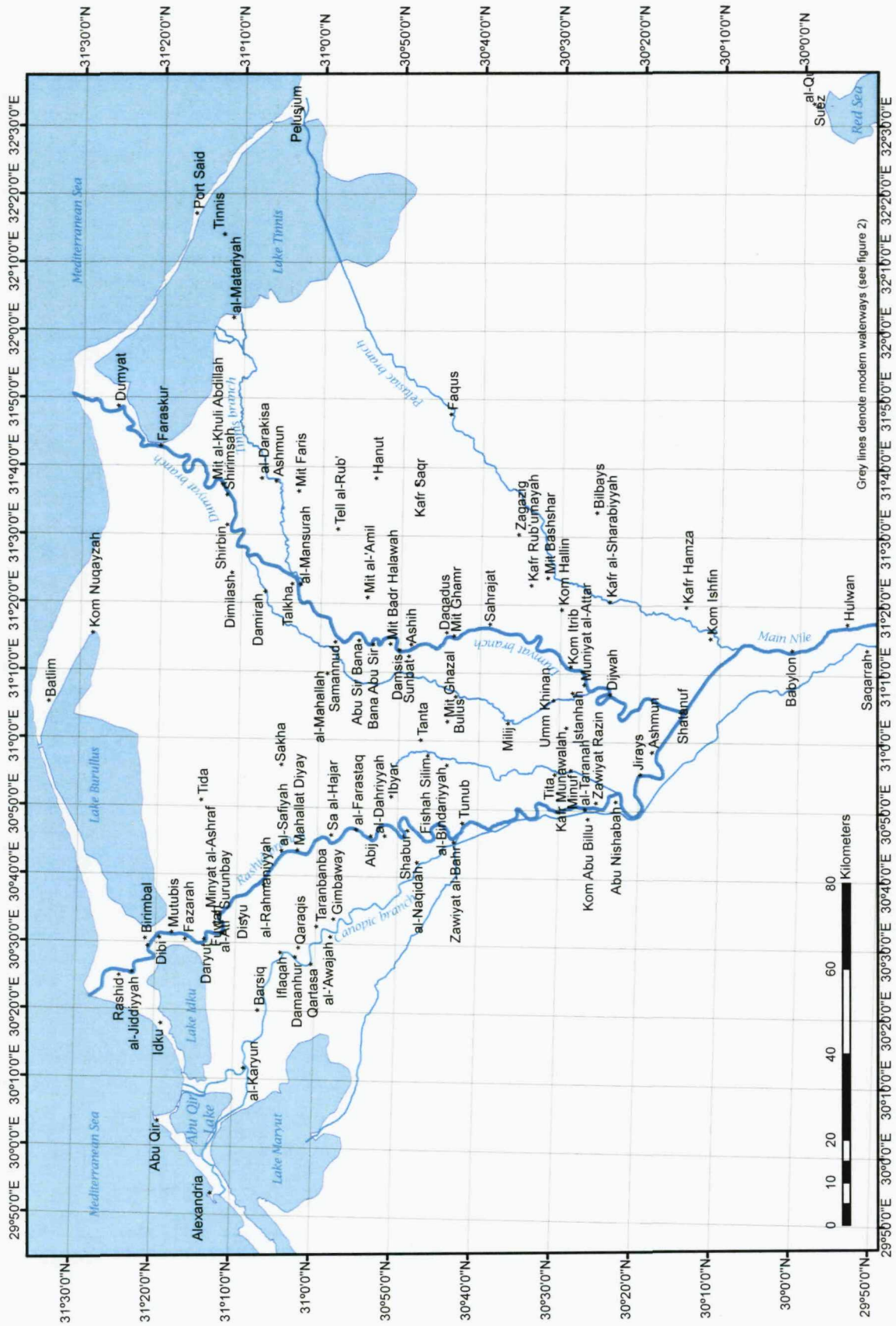


Figure 12: The Nile Delta waterways on the eve of the Islamic conquest. (Place-names are for location purposes and are not all contemporaneous)

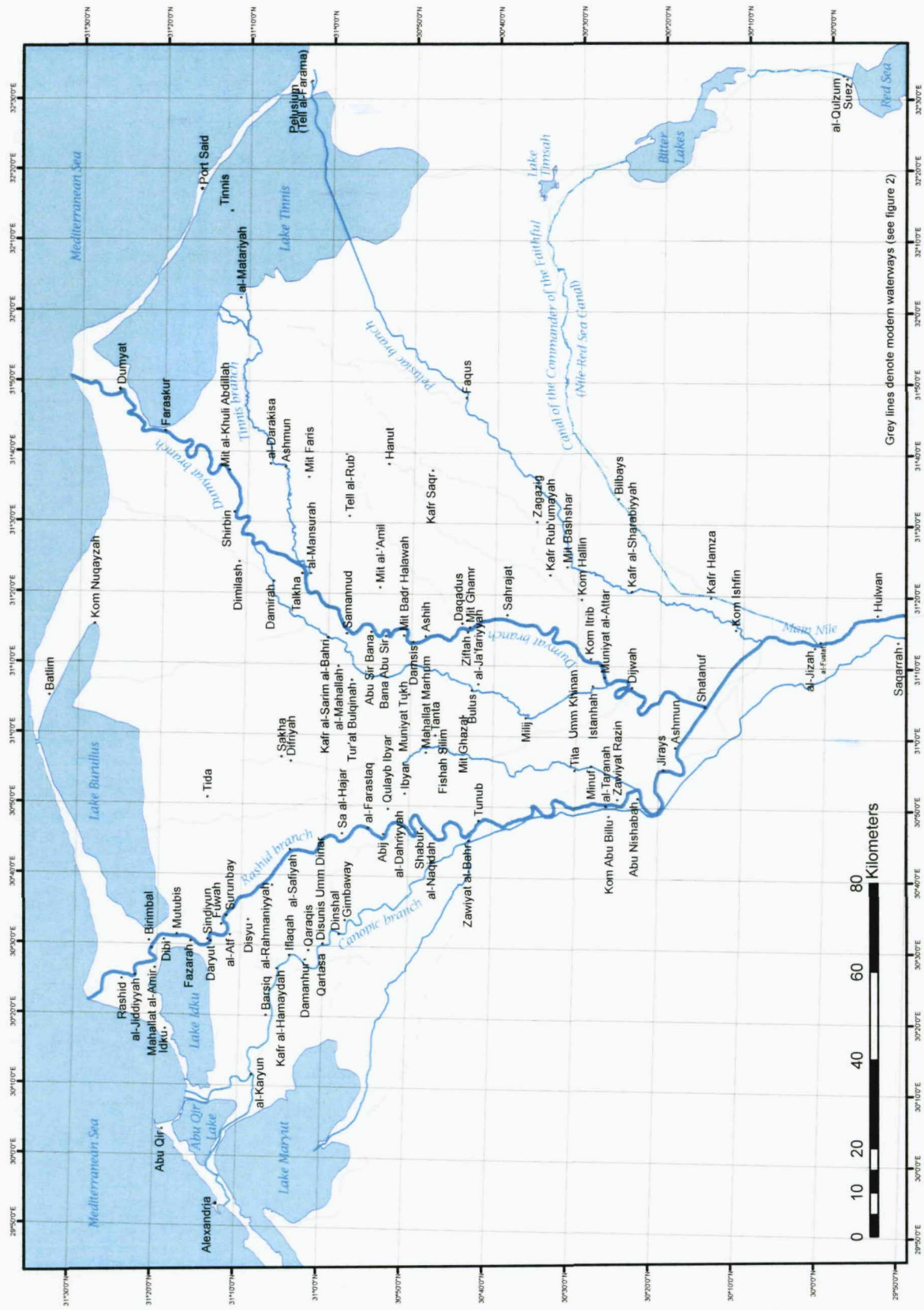


Figure 13: The Nile Delta waterways c 650 AD. (Place-names are for location purposes and are not all contemporaneous)

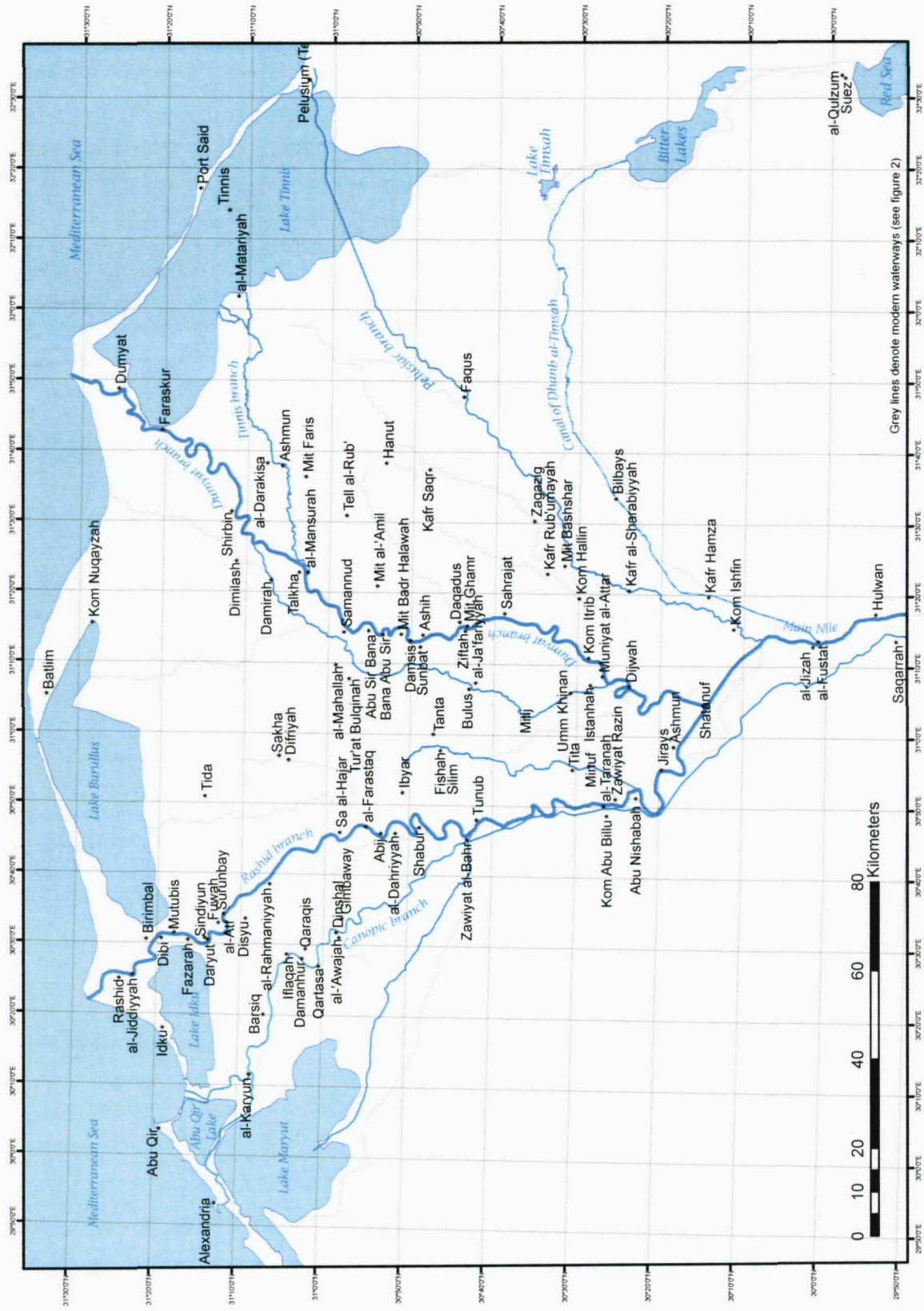


Figure 14: The Nile Delta waterways c. 770 AD. (Place-names are for location purposes and are not all contemporaneous)

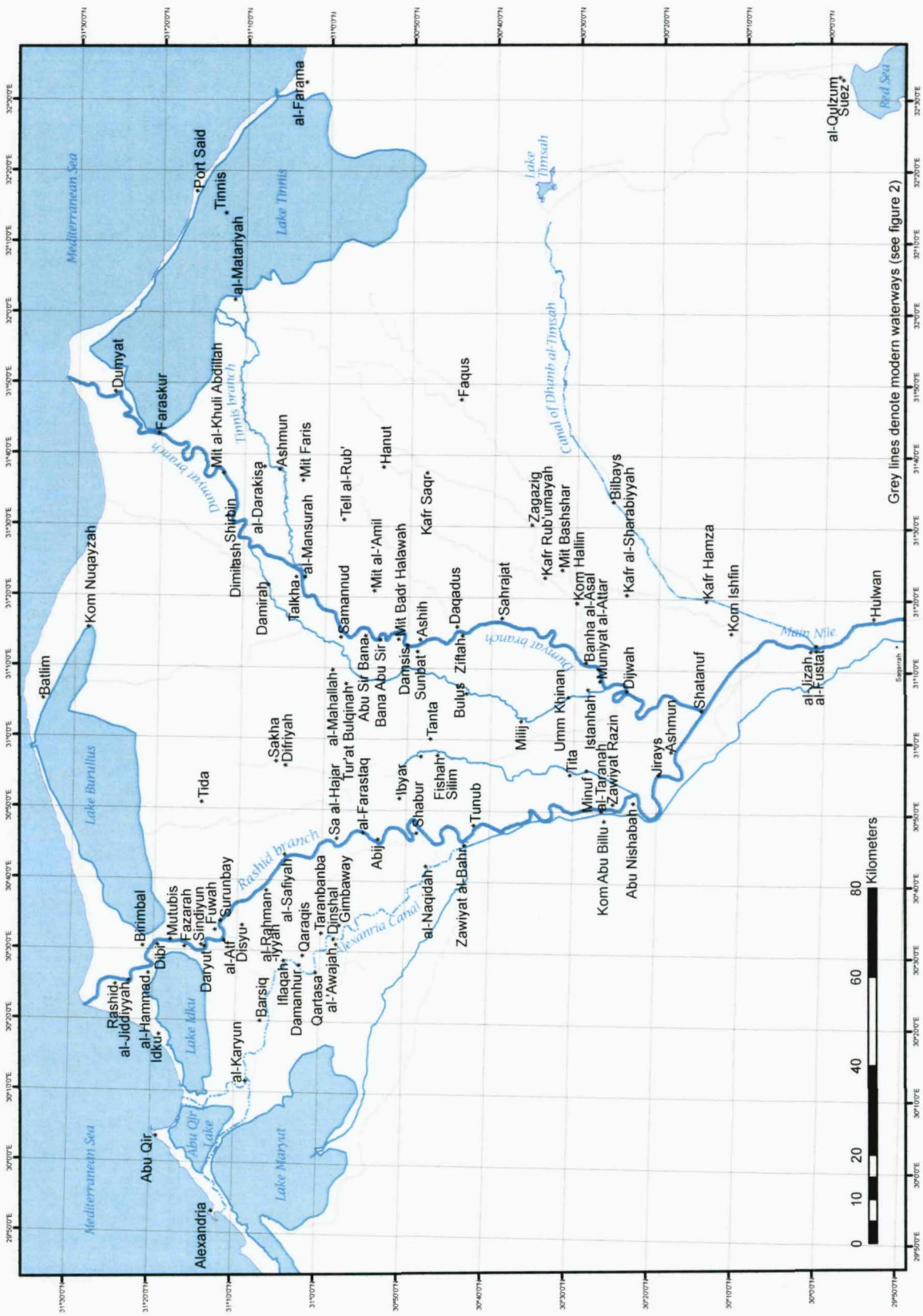


Figure 15: The Nile Delta waterways c. 950 AD. (Place-names are for location purposes and are not all contemporaneous)

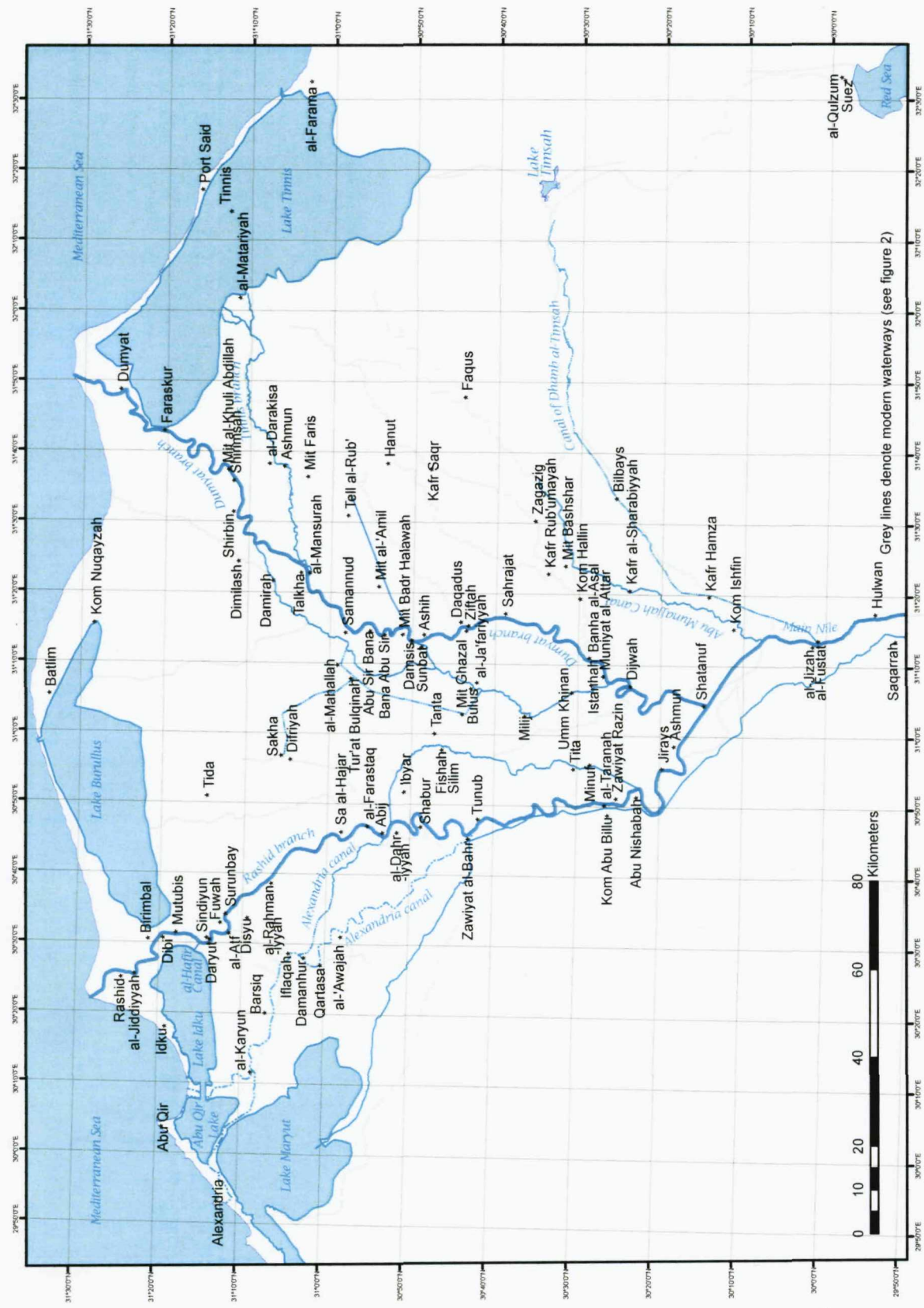


Figure 16: The Nile Delta waterways c. 1150 AD. (Place-names are for location purposes and are not all contemporaneous)

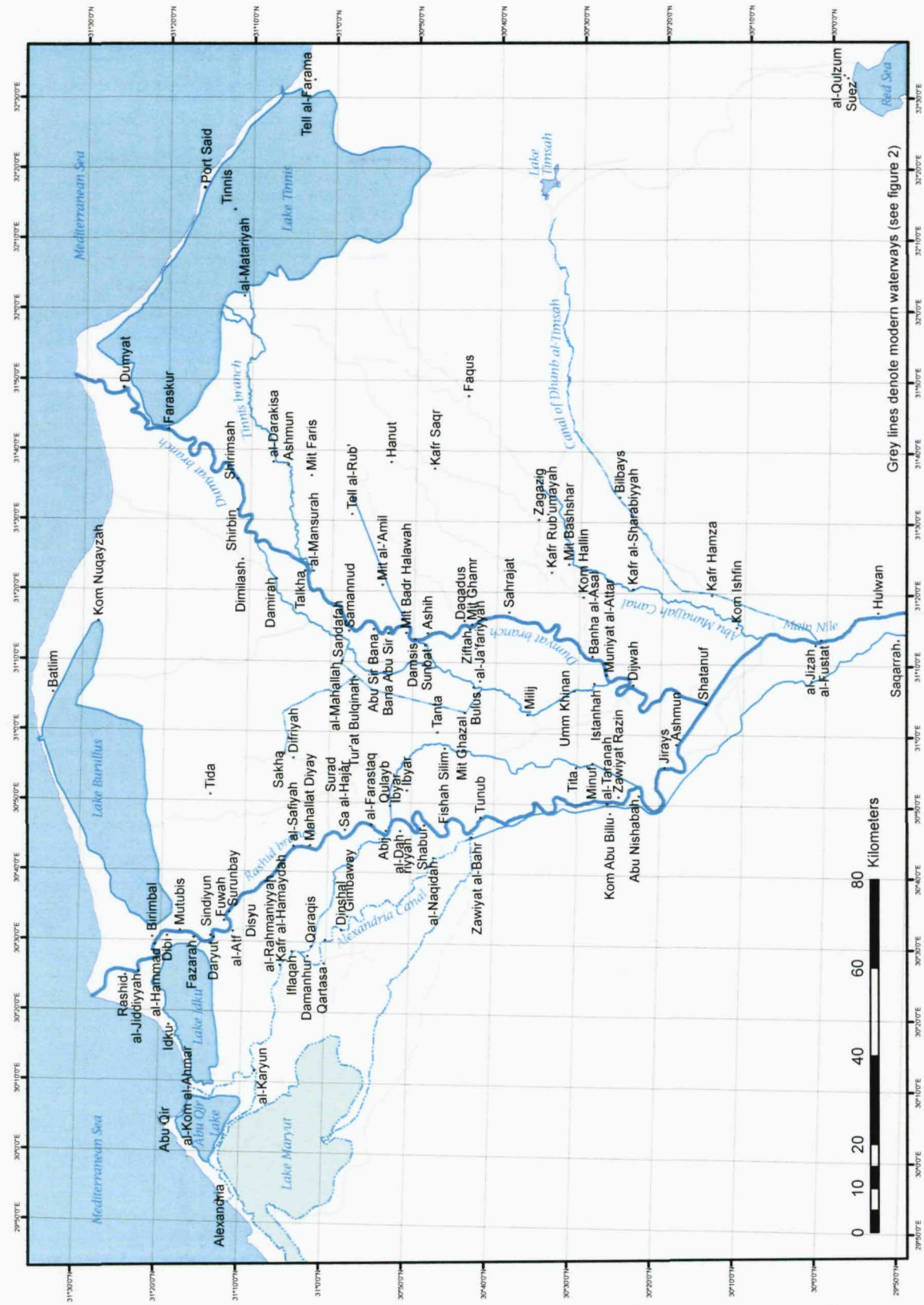


Figure 17: The Nile Delta waterways c. 1270 AD. (Place-names are for location purposes and are not all contemporaneous)

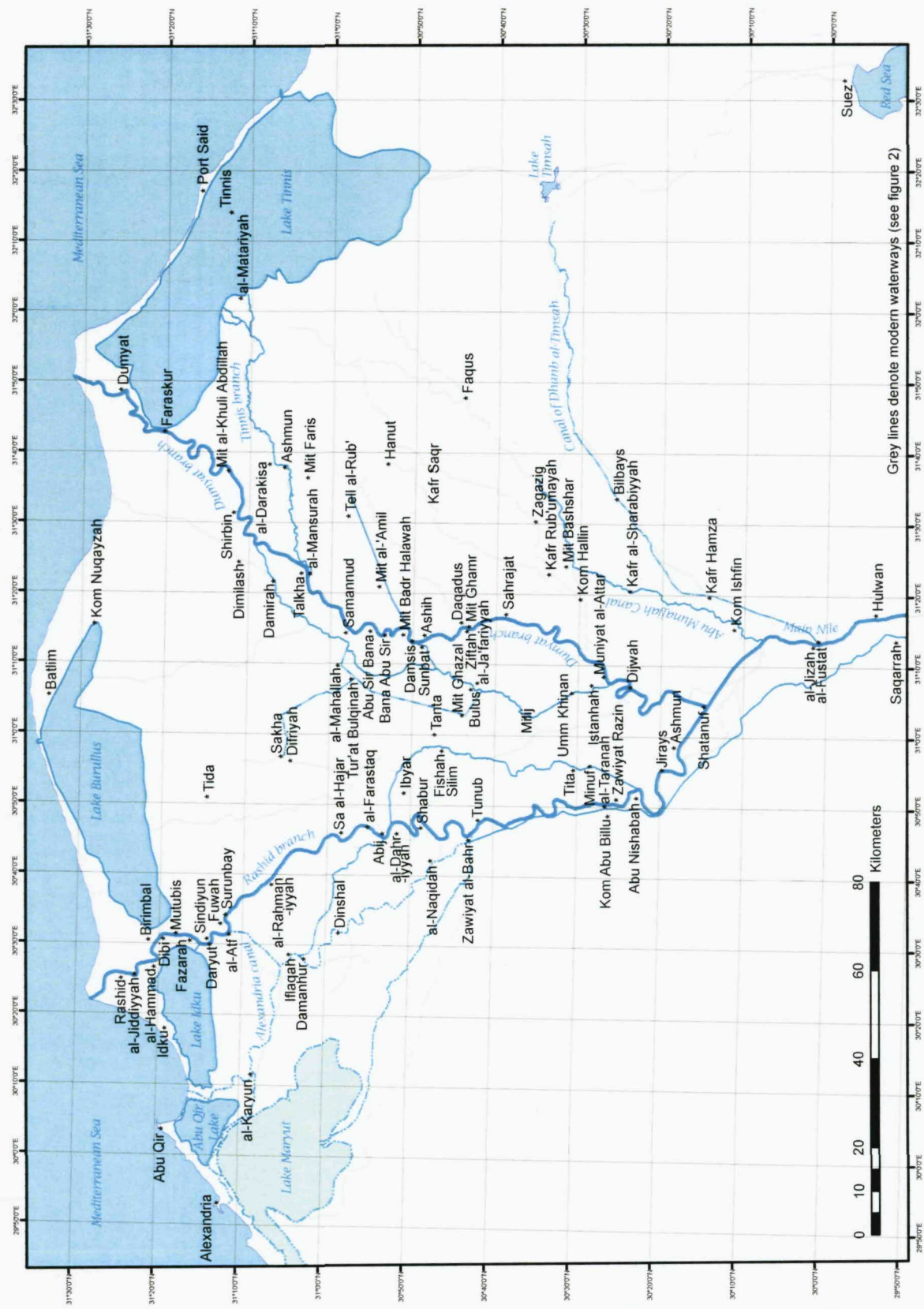


Figure 18: The Nile Delta waterways c. 1350 AD. (Place-names are for location purposes and are not all contemporaneous)

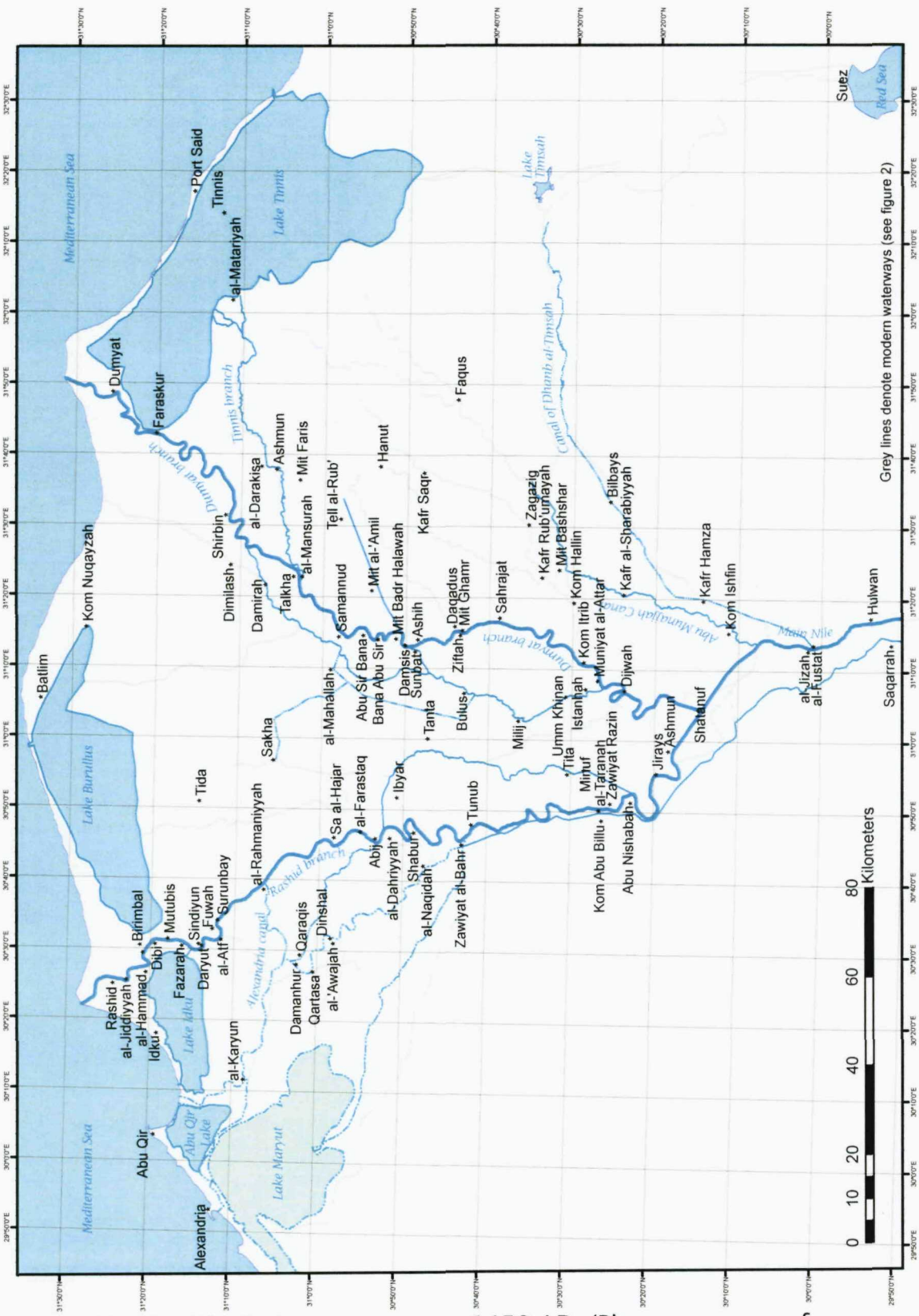


Figure 19: The Nile Delta waterways c. 1450 AD. (Place-names are for location purposes and are not all contemporaneous)

Appendix 3: Gazetteer

The following tables provide correlations between the Delta places names used by Ibn Ḥawqal and al-Idrīsī (see Section 3, and Appendix 1, Figures 14-17) and modern place names, as well as providing the latitude and longitude for each. The identifications largely follow those made by Guest (1917), with supplementary identifications made by this author. The identifications are used to establish in the contemporary landscape the routes of the waterways described by Ibn Ḥawqal and al-Idrīsī. These are represented in map form in Appendix 2, Figures 5-11).

Miṣr (al-Fusṭāṭ) to Shaṭanūf (Delta Apex) – in effect the main Nile.

East bank		West bank		Modern identification	Latitude	Longitude
Ibn Ḥawqal	al-Idrīsī	Ibn Ḥawqal	al-Idrīsī			
	Miṣr	al-Fusṭāṭ		Old Cairo	30°0'37"N	31°13'58"E
al-Jīzah				al-Jīzah (Giza)	30°1'6"N	31°12'49"E
		"Un-named city"		-	-	-
		"Un-named city"		-	-	-
	al-Munyah			Unknown	-	-
	Madinat al-Qā'id			Cairo*	30°2'51"N	31°15'38"E
			Jazīrat Anqash	Unknown	-	-
			Anbābah	Anbābah (Imbaba)	30°4'25"N	31°13'2"E
	Shubrah			Shubrah	30°4'27"N	31°14'23"E
	Baysūs			Bāsūs*	30°8'2"N	31°13'3"E
	al-Khārqaniyyah			al-Kharqaniyyah	30°10'5"N	31°11'10"E
	Sarūt			Unknown	-	-
			al-Akhṣāṣ	al-Akhṣāṣ	30°11'43"N	31° 5'30"E
	Shalaqān			Shalaqān	30°11'22"N	31° 9'39"E
			Dharawah	Dharawah	30°13'16"N	31° 5'48"E
	Zufaytah			Zufaytat Shalaqān	30°14'41"N	31° 7'24"E
Shaṭanūf		Shanaṭūf	Shanaṭūf	Shaṭanūf	30°14'17"N	31° 4'24"E

* Identifications by Guest (1912)

Shaṭanūf (Delta Apex) to Alexandria – in effect the modern Rashīd branch, followed by the Alexandria canal

Ibn Ḥawqal	Bank	al-Idrīsī	Bank	Modern identification	Latitude	Longitude
Shaṭanūf	East	Shanaṭūf	-	Shaṭanūf	30°14'17"N	31° 4'24"E
-	-	Umm Dīnār	West	Umm Dīnār	30°12'1"N	31° 4'3"E
al-Juraysāt	East	Ashmūn al-	-	Ashmūn*	30°17'49"N	30°58'37"E
-	-	Madīnat al-	East	al-Jurays*	30°19'13"N	30°55'24"E
Dhāt al-Sāḥil	West	-	-	Unknown	-	-
-	-	Rimāl al-Ṣanīm	-	Unknown	-	-
Abū	-	Abū Yuḥannas	-	Unknown	-	-
Tarnūṭ	Both	Tarnūṭ	-	al-Tarrānah*	30°26'7"N	30°50'12"E
Bastamah	-	Bastamah	-	Bishtāmī*	30°38'23"N	30°48'6"E
		Tunūb	-	Tunūb	30°41'21"N	30°48'2"E
Shābūr	-	Shābūr	-	Shabūr	30°48'12"N	30°46'52"E
Maḥallat	-	Maḥallat al-	-	al-Naqaydā*	30°46'59"N	30°42'12"E
Dinshāl	-	Dinshāl	-	Dinshāl	30°57'58"N	30°31'47"E
Qarṭasā	-	Qarṭasā	-	Qarṭasā	31° 0'0"N	30°26'60"E
Shabrū Abū	-	Suq Abī Mīnā	-	Unknown	-	-
Qaranfīl	-	Qaranfīl	-	Unknown	-	-
Barsīq	West	-	-	Barsīq*	31° 6'31"N	30°20'8"E
al-Kiryawn	Both	al-Kiryawn	-	al-Karyūn	31° 8'3"N	30°11'35"E
Qaryat al-Ṣīr	-	Qaryat al-Ṣabr	-	Unknown	-	-
Alexandria	-	Alexandria	-	Alexandria	31°11'1"N	29°53'8"E

* Identifications by Guest (1912)

A Nile waterway between the Abū Yuḥannas/Rimāl al-Ṣanīm on the modern Rashīd branch to Babīj on the modern Rashīd branch

Ibn Ḥawqal	Bank	al-Idrīsī	Bank	Modern identification	Latitude	Longitude
-	-	Rimāl al-Ṣanīm	-	Unknown	-	-
Abū	-	-	-	Unknown	-	-
Shabr wa-l-	East	-	-	Unknown	-	-
Minūf	East	Minūf al-Suflā	-	Minūf (al-	30°27'57"N	30°55'52"E
Ṭandata	-	-	-	Unknown	-	-
-	-	Tatā	-	Titā	30°29'55"N	30°55'14"E
Fīshat Banī	-	Fīshah	-	Fīshat Sulaym*	30°45'51"N	30°57'48"E
al-	-	al-Bindariyyah	East	al-Bindariyyah	30°43'26"N	30°56'27"E
-	-	al-Manār	West	Unknown	-	-
Maḥallat	-	-	-	Maḥallat	30°47'50"N	30°57'37"E
Qulayb al-	-	Qulayb al-	-	Qulayb Ibyār*	30°52'18"N	30°49'34"E
Babīj	-	Babīj	-	Abīj	30°52'49"N	30°45'59"E

The modern Rashīd branch from Babīj to the Mediterranean Sea

Ibn Ḥawqal	Bank	al-Idrīsī	Bank	Modern identification	Latitude	Longitude
Babīj	-	Babīj	-	Abīj	30°52'49"N	30°45'59E
Maḥallat	-	-	-	Unknown	-	-
Ṣā	-	Ṣāh	East	Ṣā al-Ḥajar	30°57'45"N	30°46'4"E
-	-	Maḥallat Shukalā	West	Maḥallat Ṣā*	30°59'4"N	30°45'4"E
Dayāy	-	-	-	Maḥallat	31°1'56"N	30°43'49"E
al-Ṣāfiyah	-	Istāfiyyah	East	al-Ṣāfiyah	31°3'58"N	30°43'42"E
Damījimūl	-	-	-	Jamajmān	31°6'11"N	30°41'2"E
-	-	Maḥallat al-	East	Mīt al-Ashraf*	31°12'3"N	30°34'29"E
-	-	Surunbay	West	Surunbay	31°11'31"N	30°34'11"E
Fuwwah	East	Fuwwah	-	Fuwwah	31°12'7"N	30°32'56"E
Sindiyūn	-	Sindiyūn	Island	Sindiyūn	31°13'46"N	30°30'48"E
-	-	Samdīsī	West	Unknown	-	-
Bulhīb	-	-	-	Unknown	-	-
Dasyū	East	-	-	Dīsya al-	31°8'53"N	30°33'38"E
Daryūṭ	West	-	-	Dayrūṭ	31°13'24"N	30°30'31"E
Natawayh a-	East	Naṭūbis al-	East	Miṭūbis	31°17'26"N	30°31'30"E
-	-	Qaryat al-Ḥāfir	West	Unknown	-	-
Maḥallat al-	West	-	-	Maḥallat al-	31°20'24"N	30°29'25"E
Maḥallat	West	-	-	Unknown	-	-
-	-	al-Ḥadīdiyyah	-	al-Jiddiyyah*	31°22'17"N	30°25'32"E
Rashīd	-	Rashīd	-	Rashīd	31°23'49"N	30°25'12"E
Al-Ashtum	-	-	-	-	-	-

* Identifications by Guest (1912)

Ibn Hawqal's branch parallel to the modern Rashīd branch between Babīj and Bulhīb

Ibn Ḥawqal	Bank	Modern identification	Latitude	Longitude
Babīj	-	Abīj	30°52'49"N	30°45'59"E
Maḥallat Babīj	-	Unknown	-	-
Farnawah	West	Farnawah	30°58'55"N	30°38'55"E
Maḥallat Masrūq	-	Unknown	-	-
Maḥallat Abī Kharāshah	-	Abū Kharāsh	31° 3'35"N	30°35'30"E
Fīshah	-	Fīshah	31° 7'3"N	30°32'11"E
Sindibīs	-	Unknown	-	-
Sunbādhah	-	Sanabādah	31°11'8"N	30°32'40"E
Bulhīb	-	Unknown	-	-

* Identifications by Guest (1912)

The modern Dumyāṭ branch, between Shaṭanūf (Delta Apex) and the Mediterranean Sea

Ibn Ḥawqal	*Bank*	*al-Idrīsī*	*Bank*	*Modern*	*Latitude*	*Longitude*
Shaṭanūf	-	Shaṭanūf	-	Shaṭanūf	30°14'17"N	31°4'24"E
-	-	Shanawān	-	Shanawāy	30°18'22"N	31°5'41"E
-	-	Qaryat al-	East	Unknown	-	-
-	-	Ṭant	West	Ṭant	30°21'30"N	31°5'5"E
-	-	Qushayrat al-	East	Unknown	-	-
-	-	Sayūjah	West	Asrījah*	30°24'37"N	31°5'11"E
-	-	al-Ṣāliḥiyyah	-	al-Ṣāliḥiyyah	30°18'25"N	31°6'53"E
-	-	Munyat al-'Aṭf	West	al-'Aṭf	30°25'19"N	31°5'32"E
-	-	Shayrajah	-	Asrījah*	30°24'37"N	31°5'11"E
Dajwah	East	Jadwah	East	Dijwah	30°23'9"N	31°7'3"E
-	-	Shumayriq	West	Mushayrif*	30°25'44"N	31°7'3"E
Tanūhah	-	Antūhī	West	Istanha	30°27'53"N	31°7'13"E
-	-	Munyat al-'Attār	East	Mīt al-'Attār	30°26'26"N	31°8'26"E
Banha al-'Asal	East	Munyat al-'Asal	East	Binha (al-'Asal)*	30°28'4"N	31°11'2"E
-	-	Bannah	West	Unknown	-	-
-	-	Itrīb	East	Kawm Itrīb	30°28'21"N	31°11'3"E
-	-	Janjar	-	Janjarah al-Qadīmah	30°30'10"N	31°12'58"E
-	-	Munyat al-Ḥawfī	West	Mīt al-Ḥufiyīn	30°30'57"N	31°12'33"E
-	-	Sanīt	East	Isnīt	30°31'52"N	31°14'57"E
Tafahnah	East	-	-	Tafahnah al-'Adhab	30°35'47"N	31°15'11"E
-	-	Warwarah	West	Warwarah	30°29'25"N	31°10'50"E
-	-	al-Khamāriyyah	East	Unknown	-	-
-	-	Munyat al-Ḥarūn	West	Kafr Mīt al-Ḥarūn	30°37'14"N	31°15'44"E
Ṣahrajat	-	Ṣahrashat al-	East	Ṣahrajat al-Kubrā	30°38'22"N	31°17'11"E
-	-	Ṣahrashat al-	West	Unknown	-	-
-	-	Muniyat Ghamr	East	Mīt Ghamr	30°42'47"N	31°15'26"E
-	-	Muniyat Ziftah	West	Ziftah	30°43'1"N	31°14'42"E
-	-	Muniyat al-Fīrān	West	Unknown	-	-
-	-	Qadqūs	East	Daqdūs	30°43'43"N	31°15'56"E
-	-	Muniyat Fīmās	East	Unknown	-	-
-	-	Ḥanūt	West	Ḥanūt	30°45'57"N	31°13'35"E
Ashīh	-	Muniyat Ishnah	East	Mīt Ishnā	30°48'7"N	31°14'7"E
Damsīs	Both	Damsīs	-	Damsīs	30°49'36"N	31°13'17"E
-	-	Muniyat Badr	-	Mīt Badr al-	30°50'43"N	31°14'11"E
Tanā	East	Banā	West	Banā Abū Ṣīr	30°52'54"N	31°14'4"E
Abū Ṣīr	-	Būṣīr	Island	Abū Ṣīr Banā	30°54'40"N	31°14'38"E
-	-	Raḥl Jarrāḥ	Island	Jarrāḥ	30°56'9"N	31°15'31"E
-	-	Muniyat ibn	-	Unknown	-	-
Samanūd	East	Samanūd	East	Mīt Samanūd	30°57'30"N	31°14'59"E
-	-	Madinat Samanūd	West	Samanūd	30°57'41"N	31°14'27"E
-	-	al-Tha'bāniyyah	West	Kafr al-	30°58'49"N	31°16'45"E
-	-	Muniyat 'Assās	-	Mīt Assās	30°59'55"N	31°17'34"E
Awsh	East	Waysh al-Ḥajar	East	Awīsh al-Ḥajar	31°0'35"N	31°18'54"E
Ṭalkhā	East	Ṭarkhā	West	Talkhā	31°3'7"N	31°22'50"E
-	-	Damīrah	West	Damīrah	31°6'30"N	31°21'40"E
-	-	Shirinqāsh	West	Shirinqāsh	31°5'21"N	31°24'41"E
Qajanjamah	-	-	-	-	-	-
Shirmsāḥ	West	Shirmsāḥ	East	Shirmsāḥ	31°11'25"N	31°35'49"E
-	-	Muniyat al-Ulūq	East	Unknown	-	-
Daqahlah	-	-	-	Daqahlah	31°15'6"N	31°40'38"E
-	-	Fāraskūr	East	Fāraskūr	31°19'49"N	31°42'55"E
Sharimbarim	West	-	-	Sharabās	31°16'43"N	31°40'45"E
Būrah	West	Būrah	-	Unknown	-	-
Dumyāṭ	West	Dumyāṭ	-	Unknown	-	-
Ashtum	-	-	-	Unknown	-	-

* Identifications by Guest (1912)

Al-Idrīsī's Route from al-Talkha on the modern Dumyāṭ branch to Tinnīs along the modern Baḥr al-Saghīr

al-Idrīsī	Bank	Modern identification	Latitude	Longitude
Ṭarkhā	-	Ṭalkhā	31°3'67"N	31°22'50"E
Muniyat Shahār	North	Shuhā	31°4'42"N	31°28'45"E
Maḥallat Damīnah	South	Maḥallat Damānah	31°4'37"N	31°29'46"E
Qibab al-Bāzīyār	-	al-Qibab al-Kubrā*	31°5'21"N	31°31'40"E
Qibab al-'Arīf	-	al-Qibab al-Ṣughrā*	31°5'13"N	31°33'42"E
Damū	-	Damū al-Sabākh	31°5'3"N	31°32'35"E
Ṭamākh	South	Unknown	-	-
Shamūn	-	Ashmūn Ṭanāḥ	31°5'17"N	31°37'54"E
al-Anṣar	North	Mīt al-Naṣāra	31°7'32"N	31°38'51"E
Wubaydah	South	Unknown	-	-
al-Barimbalayn	North	Birimbāl	31°9'39"N	31°44'18"E
Shunaysah	-	al-Satā'itah*	31°8'59"N	31°53'44"E
Buḥayrat Tinnīs	-	Lake Manzalah	-	-
Tinnīs	-	Tinnīs	31°12'2"N	32°14'0"E

* Identifications by Guest (1912)

Al-Idrīsī's Channel to Tinnīs from Mīt Badr Ḥalāwah on the modern Dumyāṭ branch

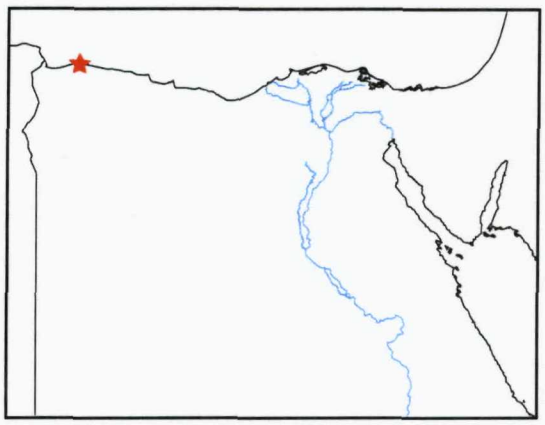
al-Idrīsī	Bank	Modern identification	Latitude	Longitude
Muniyat Badr	-	Mīt Badr al-Ḥalāwah	30°50'43"N	31°14'11"E
Shanshā	-	Shanshā	30°52'54"N	31°19'15"E
al-Buhāt	South	Unknown	-	-
Safnās	-	Unknown	-	-
Buḥayrat Zār	-	Daqahlah plain	-	-
Tinnīs	-	Tinnīs	31°12'2"N	32°14'0"E

Al-Idrīsī's channel leaving the Dumyāṭ branch at Munyat al-'Attār and rejoining it at Shubrat al-Yaman

al-Idrīsī	Bank	Modern identification	Latitude	Longitude
Munyat al-'Attār	East	Mīt al-'Attār	30°26'26"N	31° 8'26"E
Milīj	West	Milīj	30°35'53"N	31° 2'40"E
Munyat 'Abd al-Malik	East	Unknown	-	-
Ṭanṭanah	West	Unknown	-	-
Ṭanṭah	West	Ṭaṭā'ī	30°41'35"N	31° 6'7"E
al-Ja'fariyyah	East	al-Ja'fariyyah	30°41'41"N	31° 7'24"E
Bulus	West	Bulus al-Hawa	30°42'27"N	31° 6'31"E
al-Santah	East	al-Santah	30°44'53"N	31° 7'53"E
Sunbāṭ	West	Sunbāṭ	30°48'25"N	31°12'24"E
Wana'āṣar	East	Unknown	-	-
Shubrah	-	Shubrat al-Yaman	30°50'8"N	31°12'53"E
Spur leaving the above at "Ṭanṭah" (Ṭaṭā'ī) and going to the modern Dumyāṭ branch near Damīrah:				
Ṭanṭah	-	Ṭaṭā'ī	30°41'35"N	31° 6'7"E
Muniyat Ghazāl	East	Mīt Ghazāl	30°43'27"N	31° 2'51"E
Maḥallat Abī Haytham	West	al-Haytham	30°54'48"N	31° 5'60"E
Tur'at Bulqīnah	-	Bulqīnah	30°56'55"N	31° 7'51"E
al-Maḥallah al-Kubrā	-	al-Maḥallah	30°58'33"N	31° 9'45"E
Sandafah	West	Sandafah	30°58'26"N	31°10'11"E
Maḥallat al-Dākhil	-	Unknown	-	-
Damīrah	-	Damīrah al-Qadīm	31° 6'30"N	31°21'40"E
Spur leaving the above at Tur'at Bulqīnah and going to Ṣakhā:				
Tur'at Bulqīnah	-	Bulqīnah	30°56'55"N	31°7'51"E
Dār al-Baqar	West	Dār al-Baqar al-Qiblī, or	30°59'23"N	31°5'39"E
		Dār al-Baqar al-Baḥyriyyah	31°0'10"N	31°5'55"E
al-Mu'tamidah	West	al-Mu'tamidiyyah	31°1'33"N	31°5'30"E
al-Matbūl	West	al-Matbūl	31°5'33"N	31°2'30"E
Ṣakhā	-	Ṣakhā	31°5'14"N	30°56'50"E

Appendix 4: Meteorological Data

Table 1: Sīdī Barrānī



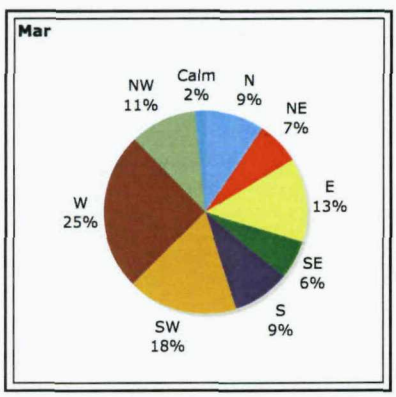
Location: 31° 36' 39" N, 25° 55' 35" E

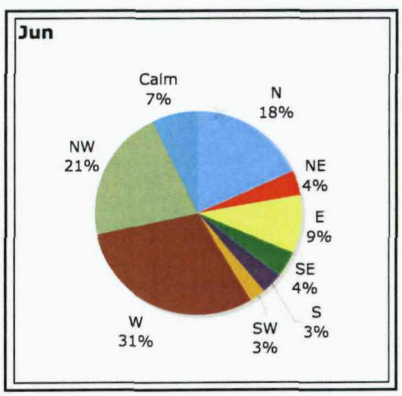
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 10).

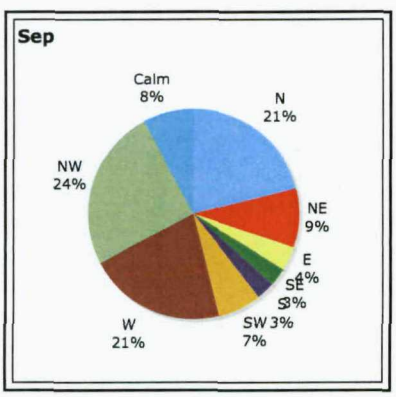
A.

Wind	Speed		Direction (08:00hrs) (%)								
1913-1918	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	1	2	2.4		1.6	3.4	26.6	25.0	6.4	2.4	32.3
Feb	0.9	1.8	3.1	3.1	7.5	4.0	11.5	17.7	8.0	2.7	42.5
Mar	1	2	12.5	9.7	6.4	4.4	8.0	15.7	10.1	8.9	24.2
Apr	1.1	2.5	15.4	15.8	12.1	3.3	8.3	12.1	10.4	8.3	14.2
May	1	2	20.6	14.1	11.8	6.4	2.4	6.0	6.4	16.1	16.1
Jun	0.9	1.8	15.8	7.5	5.0	3.8	3.8	3.8	7.9	23.3	29.2
Jul	0.8	1.6	18.5	2.8	0.4	0.4	1.6	9.7	11.3	26.2	29.0
Aug	0.9	1.8	9.7	2.4	4.0	0.4	2.4	6.4	17.7	30.2	26.6
Sep	0.8	1.6	9.6	0.8		2.9	2.4	2.5	12.8	22.5	46.6
Oct	0.6	1.2	7.3	3.2	1.2	3.6	2.4	3.2	3.6	13.3	62.2
Nov	0.6	1.2	3.3	2.4	1.6	0.4	10.8	19.6	8.3	3.8	50.0
Dec	0.7	1.4	2.2	0.4	2.4	2.8	12.1	14.5	4.4	3.2	58.0

B.







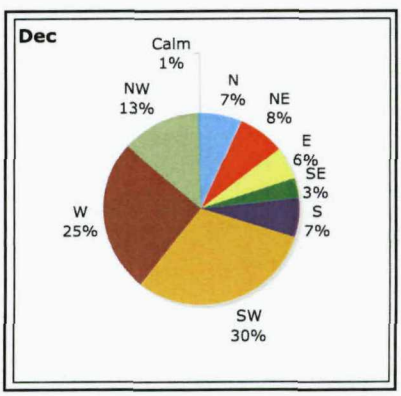
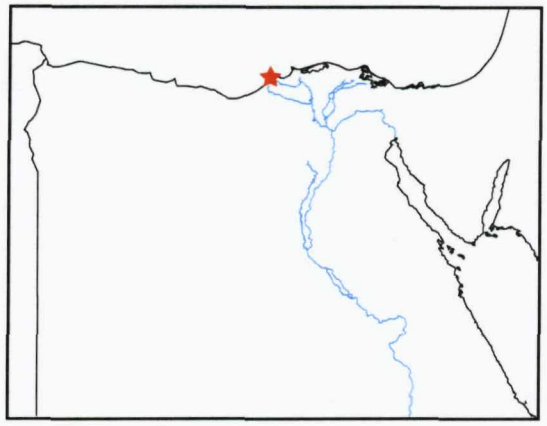


Table 2: Alexandria



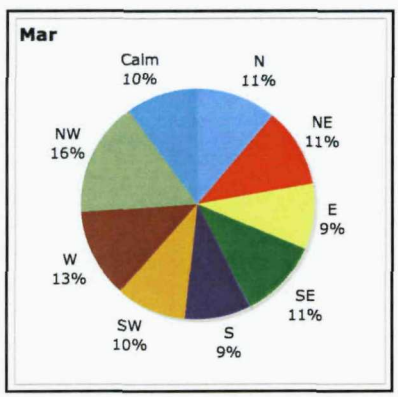
Location: 31° 11' 55" N, 29°, 53' 10" E.

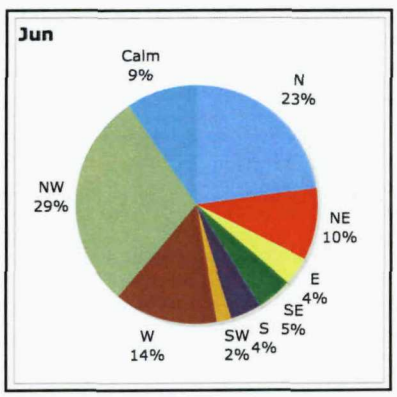
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 13). The graph (C) overleaf shows diurnal variation in wind speed (Ministry of Public Works 1931: Plate 37).

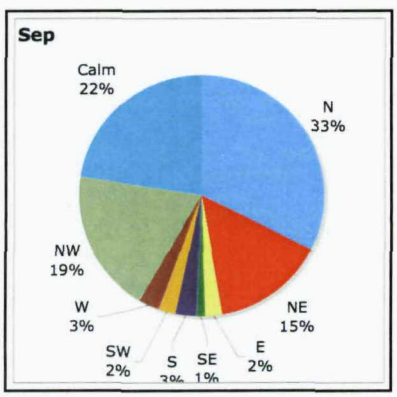
A.

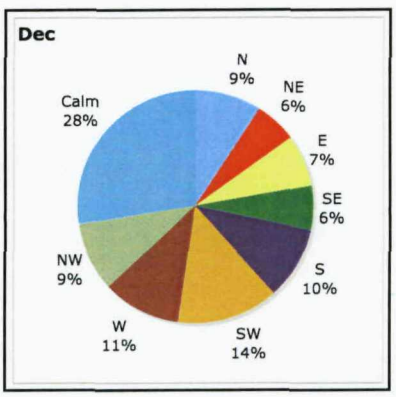
Wind	Speed		Direction (%)								
1901-1920	Beaufort	km/	N	NE	E	SE	S	SW	W	NW	Calm
Jan	2.6	11.2	10.6	4.1	7.0	7.3	8.5	18.0	10.8	12.4	21.4
Feb	2.7	11.9	8.6	5.2	6.6	9.0	12.5	15.6	11.9	11.3	19.2
Mar	2.8	12.6	11.0	11.	9.1	11.0	9.2	9.8	12.5	16.1	10.0
Apr	2.7	11.9	12.2	11.	11.5	10.2	7.2	4.3	11.5	19.9	12.3
May	2.3	9.1	14.0	184	9.6	10.4	7.1	2.0	10.0	16.8	11.7
Jun	2.8	12.6	22.9	9.7	3.9	4.6	4.4	1.9	13.9	29.5	9.4
Jul	2.8	12.6	25.4	4.7	0.4	0.4	0.3	0.4	16.4	43.0	8.9
Aug	2.7	11.9	32.6	9.7	-	0.2	0.6	0.8	9.7	36.6	9.9
Sep	2.3	9.1	32.5	14.	2.3	1.1	2.8	2.0	3.0	19.1	22.4
Oct	2.1	7.7	17.3	19.	11.4	3.8	7.4	2.7	3.9	9.4	24.2
Nov	2.1	7.7	10.1	10.	8.9	6.1	7.5	17.2	7.6	7.4	24.1
Dec	2.2	8.4	9.3	5.6	7.3	6.2	9.8	14.0	10.8	9.4	27.6

B.









C.

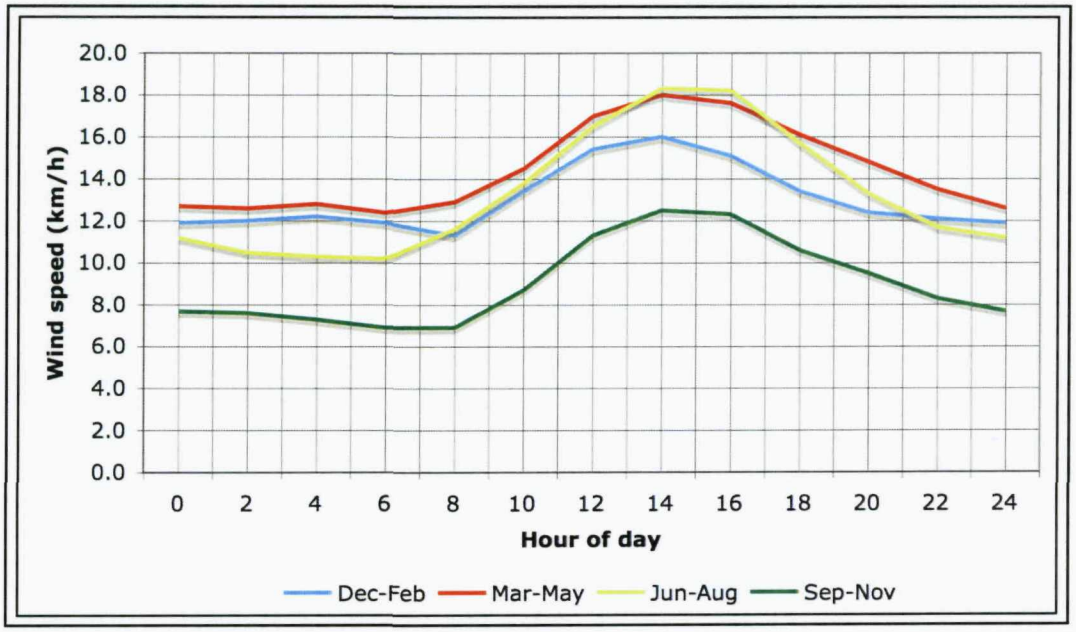
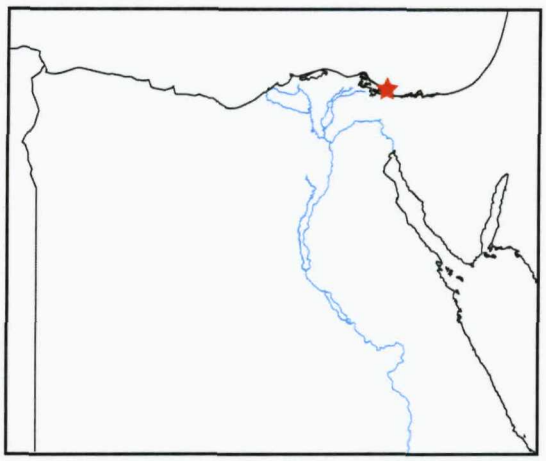

20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Wind speed (km/h)
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour of day
Dec-Feb
Mar-May
Jun-Aug
Sep-Nov

Table 3: Port Said

Location: 31° 15' 25" N, 32° 17' 31" E.

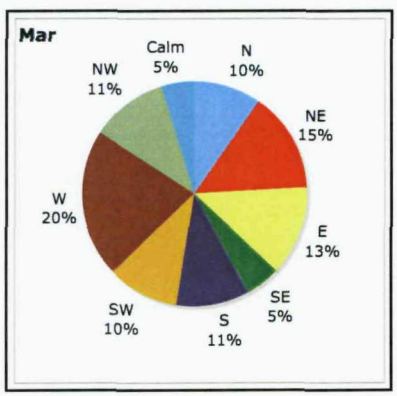


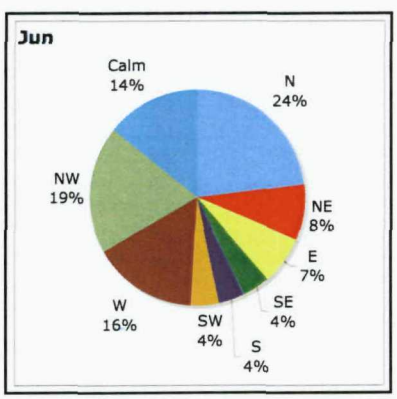
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 13).

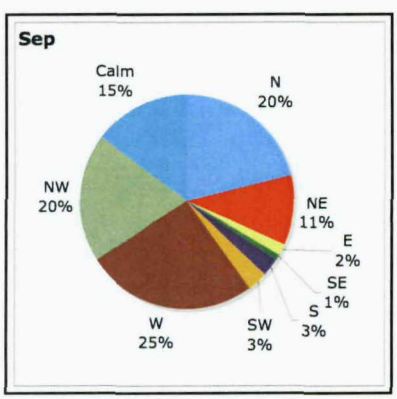
A.

Wind	Speed		Direction (%)								
1901-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	2.3	9.1	5.4	7.7	8.6	4.1	10.3	21.0	24.7	9.5	8.7
Feb	2.4	9.8	5.9	9.1	12.6	5.9	10.5	15.0	10.7	7.8	22.5
Mar	2.7	11.9	9.6	14.5	12.8	5.0	10.6	10.2	21.2	11.3	4.6
Apr	2.7	11.9	12.2	14.9	15.2	5.6	7.6	9.1	17.6	11.9	5.8
May	2.3	9.1	18.5	16.4	16.8	5.4	4.5	4.6	15.2	10.8	7.6
Jun	2	7	23.1	8.3	7.2	4.2	3.8	4.3	15.8	19.2	14.2
Jul	1.9	6.5	14.8	4.7	1.4	0.2	1.2	5.5	29.7	30.2	12.3
Aug	1.9	6.5	17.2	7.3	1.0	0.6	1.2	6.6	27.2	23.0	16.1
Sep	1.9	6.5	21.0	10.7	1.5	0.9	2.9	2.9	25.9	19.6	14.6
Oct	2.1	7.7	18.2	18.5	7.0	5.2	6.0	6.6	14.5	14.0	9.8
Nov	2.2	8.4	11.3	13.7	6.1	4.0	9.3	18.8	20.8	10.8	5.2
Dec	2.2	8.4	6.2	8.8	6.0	5.5	10.7	24.6	21.1	10.1	6.8

B.







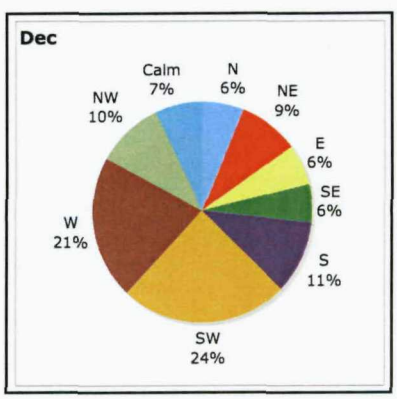
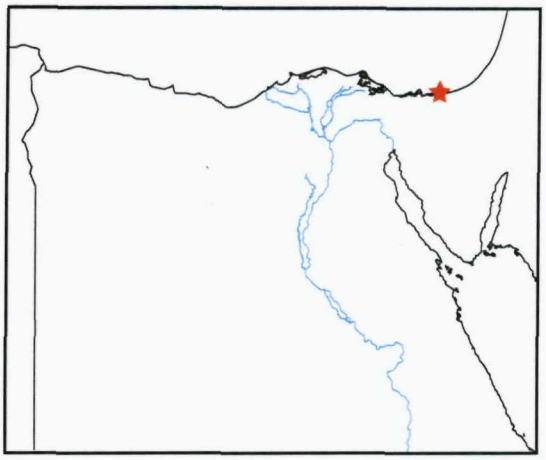


Table 4: Al-'Arīsh



Location: 31° 07' 53" N, 33° 48' 31" E.

The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 15).

A.

Wind	Speed		Direction (%)								
1901-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	2.3	9.1	3.5	-	-	1.4	34.8	44.5	7.1	4.6	4.1
Feb	2.5	10.5	5.8	3.5	-	1.5	22.1	47.5	6.5	7.0	6.0
Mar	2.5	10.5	11.1	2.5	2.3	0.9	20.7	45.6	7.6	6.0	3.2
Apr	2.4	9.8	1.7	3.3	3.8	3.3	20.5	44.3	9.5	4.5	9.0
May	2.2	8.4	6.2	5.8	2.5	4.4	21.4	31.8	11.3	8.3	8.3
Jun	2.2	8.4	9.3	3.6	0.5	1.2	10.0	41.0	13.1	10.5	11.0
Jul	2.1	7.7	3.2	0.9	0.5	0.5	7.1	57.1	12.4	6.7	11.5
Aug	1.8	2.5	4.8	-	-	-	6.2	53.9	12.2	4.8	18.0
Sep	1.8	2.5	6.0	-	-	1.2	9.5	47.9	10.0	6.9	18.6
Oct	1.8	2.5	5.3	2.1	2.3	0.5	22.8	43.5	9.2	2.3	12.0
Nov	2.0	7.0	3.6	-	1.2	1.9	33.3	51.7	2.4	2.6	3.3
Dec	2.1	7.7	1.2	0.7	0.5	1.4	32.7	56.2	2.8	2.3	2.3

B.

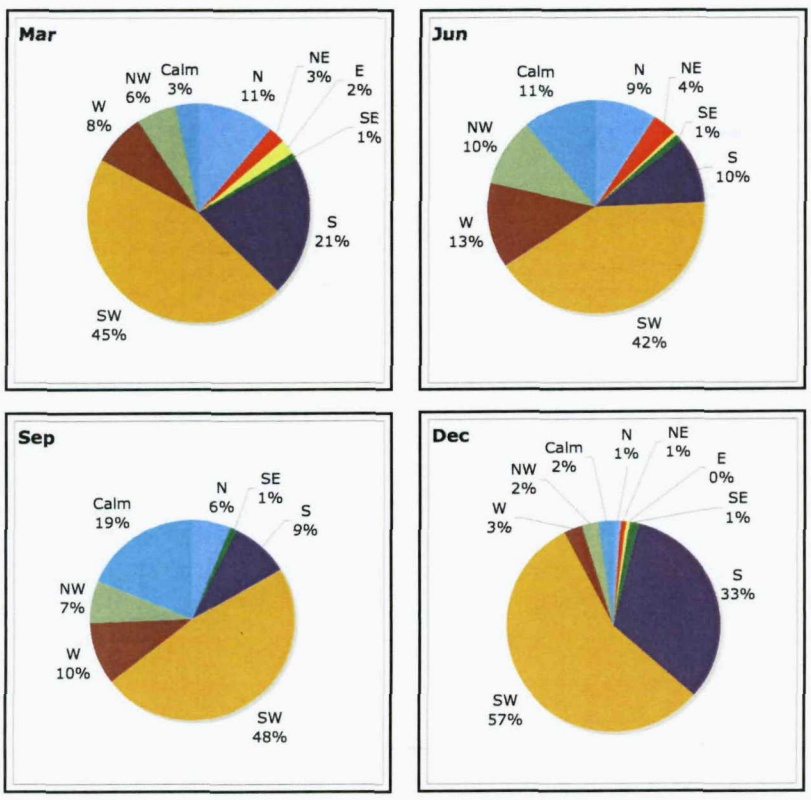
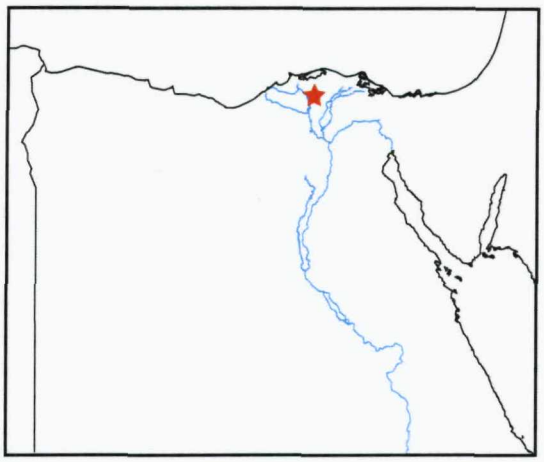


Table 5: Sakhā

Location: 31° 05' 14" N, 30° 56' 43" E

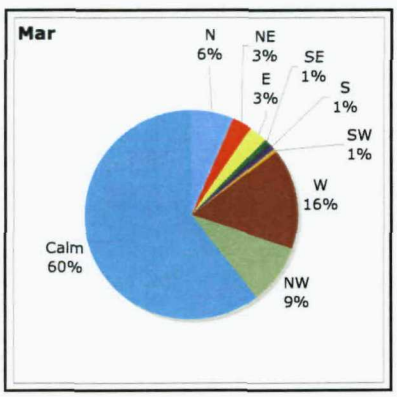


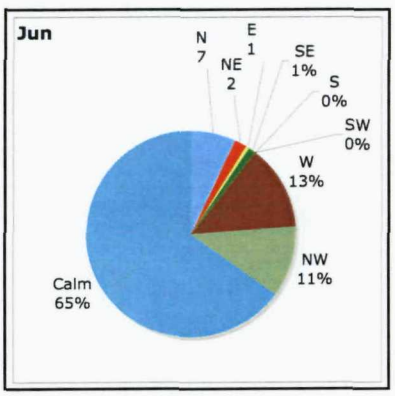
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 15).

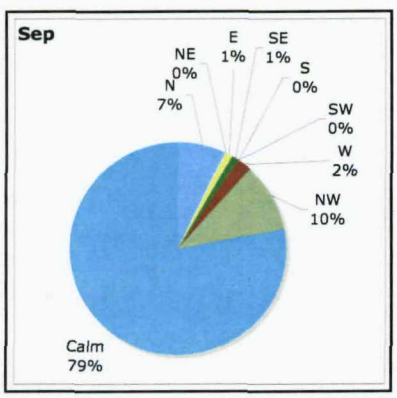
A.

Wind	Speed		Direction (%)								
1907-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	1.3	3.5	4.3	2.2	0.7	-	-	1.4	17.7	7.7	65.9
Feb	1.4	4	4.3	2.7	2.7	0.8	-	1.2	12.4	6.9	69.0
Mar	1.5	4.5	6.3	3.0	3.0	0.7	1.1	0.5	15.6	9.1	60.6
Apr	1.6	5	6.7	4.6	8.3	0.7	-	-	10.2	12.0	57.4
May	1.5	4.5	9.1	4.5	2.9	-	-	0.4	10.9	10.6	61.6
Jun	1.1	2.5	6.9	1.9	0.6	1.1	-	-	13.3	11.1	65.2
Jul	1	2	5.9	0.2	0.5	1.8	-	-	9.5	10.4	71.7
Aug	0.8	1.6	2.7	0.7	0.4	1.4	-	-	5.7	11.3	77.8
Sep	0.7	1.4	7.2	-	1.1	1.1	-	-	2.2	10.2	78.1
Oct	0.8	1.6	10.9	2.3	1.4	-	-	-	2.3	12.4	70.6
Nov	0.8	1.6	8.5	2.4	2.0	0.2	0.2	0.6	8.5	10.9	66.7
Dec	1	2	4.8	2.2	2.3	-	0.9	1.6	10.8	7.9	69.5

B.







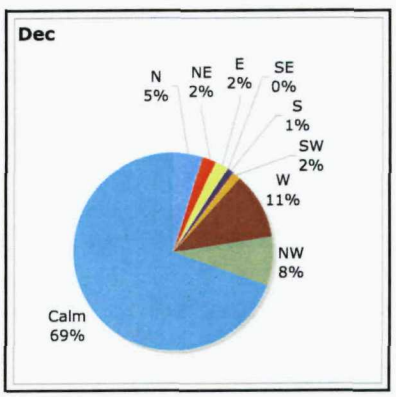
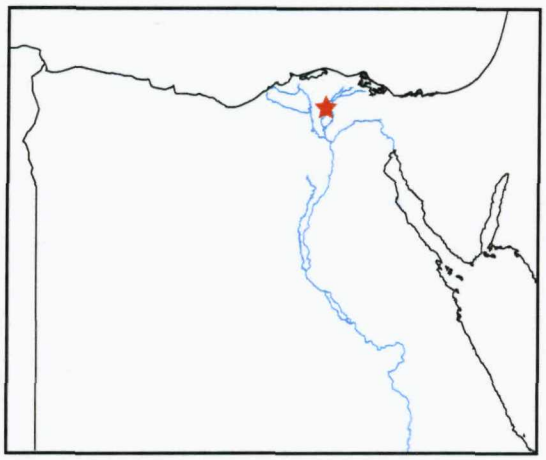


Table 6: Qurashiyyah



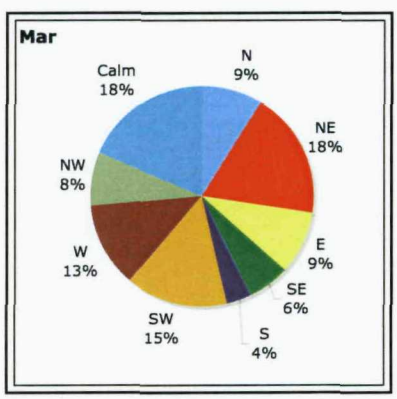
Location: 30°51'N 31°07'E.

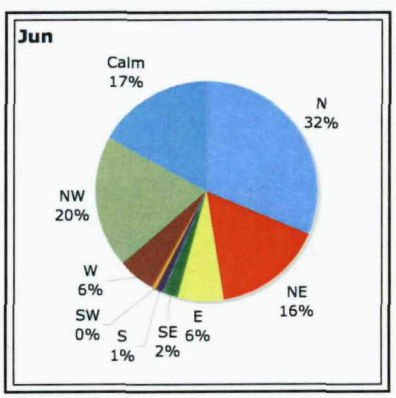
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts show mean wind direction for four indicative months (Ministry of Public Works 1922: 17).

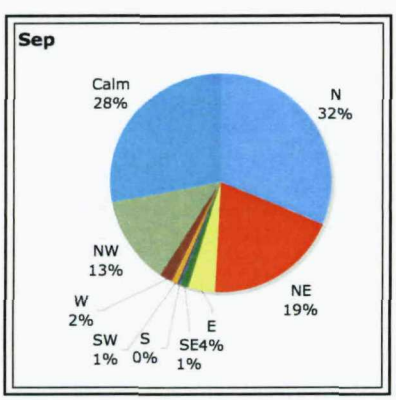
A.

Wind	Speed		Direction (%)								
1907-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	1.2	3.0	5.9	6.5	4.1	5.7	5.9	21.3	9.3	5.7	35.5
Feb	1.3	3.5	7.3	6.5	7.1	7.1	6.7	17.1	11.8	3.1	33.3
Mar	1.4	4.0	9.0	18.5	9.1	6.1	3.8	14.7	12.5	7.7	18.6
Apr	1.4	4.0	15.2	19.3	16.5	5.9	2.6	5.0	11.7	13.5	10.4
May	1.4	4.0	20.1	26.7	12.9	8.1	1.6	1.6	2.7	15.9	10.4
Jun	1.4	4.0	31.3	16.3	6.5	2.4	1.1	0.4	5.7	19.4	17.0
Jul	1.3	3.5	36.5	11.6	2.1	0.9	0.2	0.5	5.4	29.4	13.3
Aug	1.0	2.0	34.7	17.0	1.3	0.4	0.7	0.7	5.6	23.4	16.1
Sep	0.9	1.8	31.5	19.3	3.9	1.3	0.4	0.7	2.2	12.6	28.1
Oct	0.7	1.4	25.3	17.2	5.6	2.5	0.7	2.5	3.6	7.9	34.8
Nov	0.8	1.6	10.7	10.2	3.5	1.5	4.3	14.3	11.1	4.4	40.0
Dec	1.0	2.0	9.3	7.3	3.8	6.1	4.7	13.8	9.5	3.2	42.3

B.







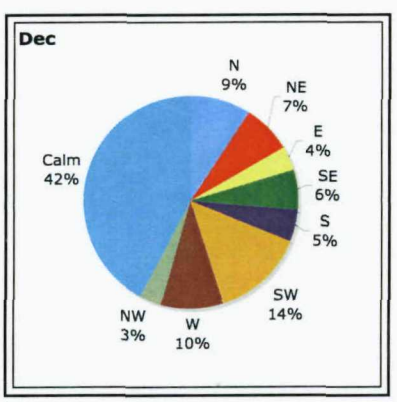
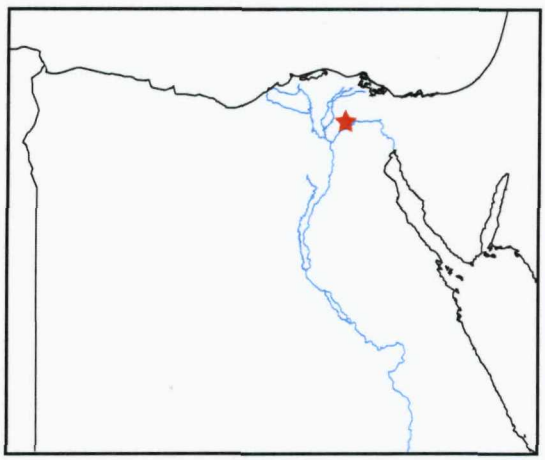


Table 7: Zagazig



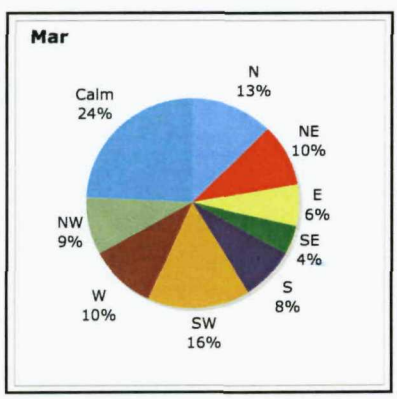
Location: 30° 35' 07" N, 31° 30' 06" E.

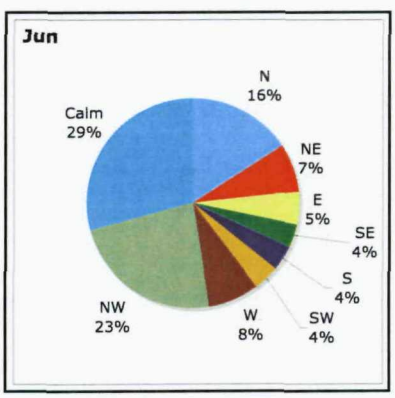
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 17). Graph (C) shows the percentage of monthly mean winds containing a northerly component (NW, N, NE), derived from the data in A.

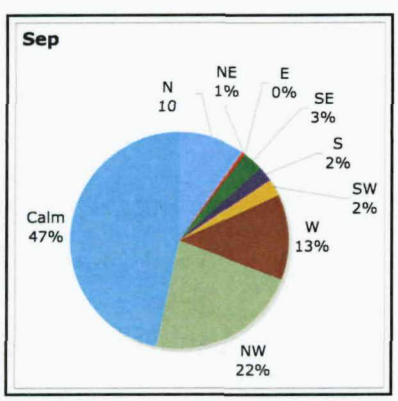
A.

Wind	Speed		Direction (8hrs) (%)								
1913-1918	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	1.0	2.0	2.4	-	1.6	3.4	26.6	25.0	6.4	2.4	32.3
Feb	0.9	1.8	3.1	3.1	7.5	4.0	11.5	17.7	8.0	2.7	42.5
Mar	1.0	2.0	12.5	9.7	6.4	4.4	8.0	15.7	10.1	8.9	24.2
Apr	1.1	2.5	15.4	15.8	12.1	3.3	8.3	12.1	10.4	8.3	14.2
May	1.0	2.0	20.6	14.1	11.8	6.4	2.4	6.0	6.4	16.1	16.1
Jun	0.9	1.8	15.8	7.5	5.0	3.8	3.8	3.8	7.9	23.3	29.2
Jul	0.8	1.6	18.5	2.8	0.4	0.4	1.6	9.7	11.3	26.2	29.0
Aug	0.9	1.8	9.7	2.4	4.0	0.4	2.4	6.4	17.7	30.2	26.6
Sep	0.8	1.6	9.6	0.8	-	2.9	2.4	2.5	12.8	22.5	46.6
Oct	0.6	1.2	7.3	3.2	1.2	3.6	2.4	3.2	3.6	13.3	62.2
Nov	0.6	1.2	3.3	2.4	1.6	0.4	10.8	19.6	8.3	3.8	50.0
Dec	0.7	1.4	2.2	0.4	2.4	2.8	12.1	14.5	4.4	3.2	58.0

B.







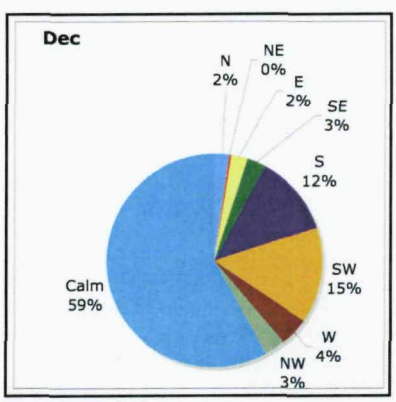
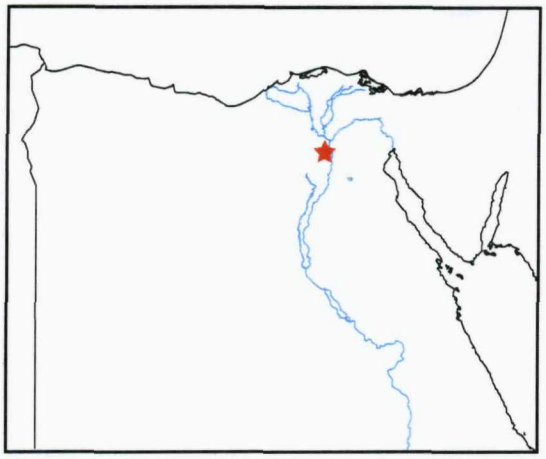


Table 8: Giza (al-Jīzah)

Location: 30° 00' 11" N, 31° 10' 43"

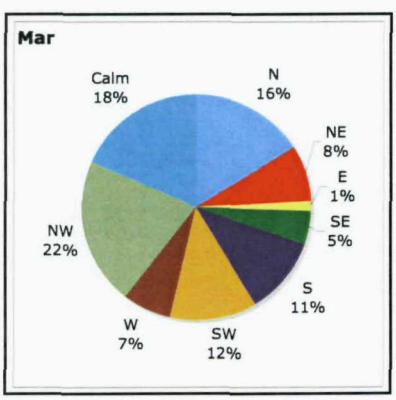


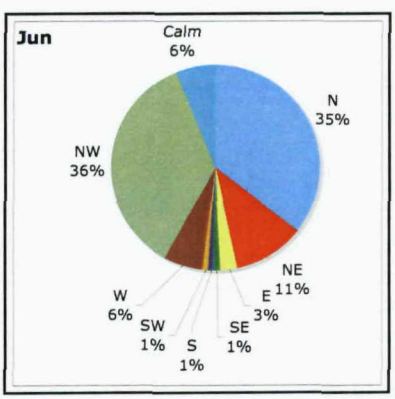
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 23).

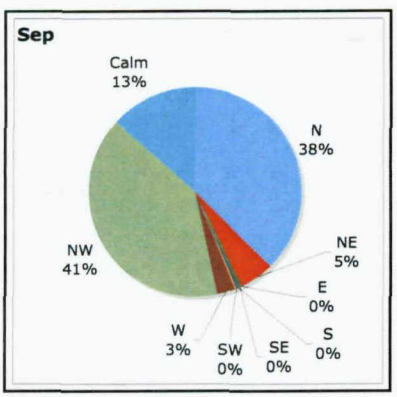
A.

Wind	Speed		Direction (%)								
1902-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	0.8	1.6	7.4	3.8	1.1	8.8	17.0	15.8	5.9	14.6	24.9
Feb	0.9	1.8	9.2	5.6	0.8	9.3	18.2	13.4	7.1	12.0	24.3
Mar	1.1	2.5	16.1	8.2	1.2	4.8	11.2	12.3	6.7	21.3	18.3
Apr	1.1	2.5	24.6	9.4	1.6	2.1	6.2	7.7	8.7	26.9	12.9
May	1.2	3.0	32.5	15.9	3.1	2.5	2.8	2.9	4.4	24.7	11.2
Jun	1.3	3.5	35.6	11.1	2.6	1.0	1.0	0.7	6.2	35.9	6.0
Jul	1.1	2.5	38.5	6.6	0.4	0.3	-	0.5	3.4	41.2	9.0
Aug	1.0	2.0	44.0	4.7	-	0.2	0.2	0.5	2.6	38.3	9.5
Sep	0.9	1.8	37.4	5.4	-	0.4	0.2	0.4	2.9	39.8	13.3
Oct	0.9	1.8	30.9	9.2	1.5	2.8	2.9	1.9	3.8	29.4	17.6
Nov	0.8	1.6	18.2	6.2	1.3	7.8	14.4	7.6	4.2	18.2	22.0
Dec	0.7	1.4	7.0	2.9	1.7	8.7	20.2	11.8	7.0	16.1	24.5

B.







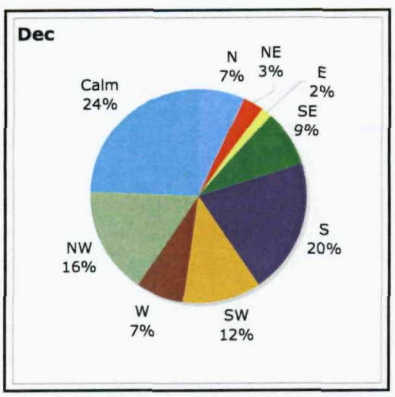
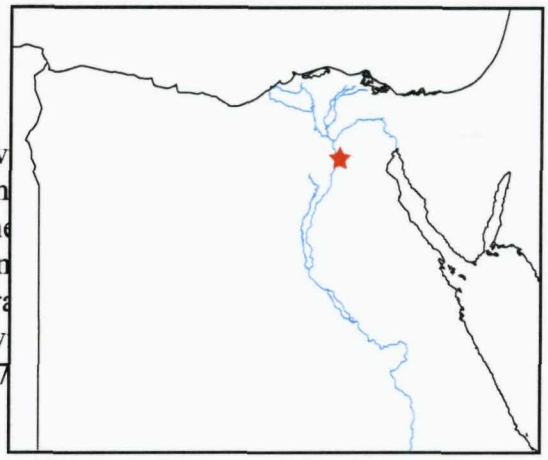


Table 9: Ḥulwān



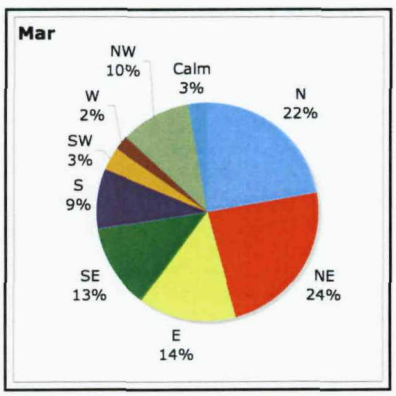
Location: 29° 53' 00" N, 31° 18' 37" E.

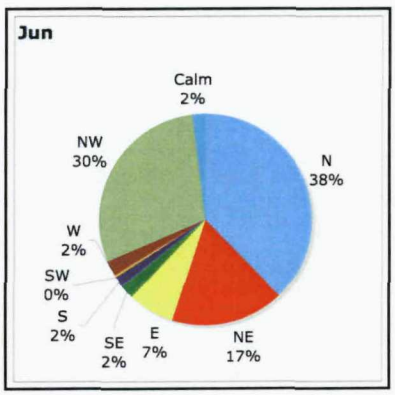
The table (A) below gives mean monthly w
strengths (means of day) and wind direction
08:00hrs. The following pie charts (B) show me
wind direction for four indicative mon
(Ministry of Public Works 1922: 25). The gra
(C) overleaf shows diurnal variation in w
speed (Ministry of Public Works 1931: Plate 37

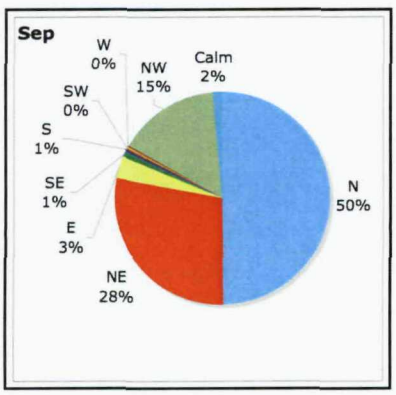
A.

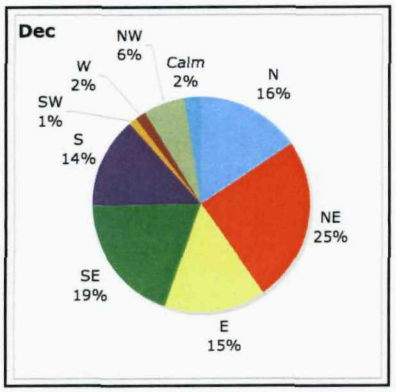
Wind	Speed		Direction (%)								
1904-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	2.4	9.8	13.4	22.3	16.1	2.0	14.8	2.9	1.4	5.6	21.6
Feb	2.7	11.9	11.5	17.9	17.7	22.1	13.9	5.4	3.5	5.0	3.0
Mar	2.9	13.3	22.1	23.8	14.1	12.5	8.9	3.3	2.2	10.3	2.7
Apr	3.2	15.4	22.8	18.8	10.5	9.6	8.7	4.1	4.7	18.3	2.3
May	3.3	16.1	34.9	20.0	8.1	4.6	2.4	2.7	2.6	23.0	1.9
Jun	3.5	17.5	37.8	17.2	7.1	2.1	1.8	0.3	2.4	29.6	1.9
Jul	3.2	15.4	41.1	10.7	0.6	0.9	0.4	-	2.7	39.5	4.2
Aug	3.2	15.4	53.7	13.4	1.6	0.7	0.2	0.2	1.1	27.4	1.5
Sep	3.3	16.1	49.7	28.3	3.3	0.8	0.6	0.3	0.3	15.1	1.5
Oct	3.2	15.4	37.5	31.3	9.7	6.8	1.9	0.2	1.4	9.3	2.0
Nov	2.8	12.6	21.5	30.9	15.3	14.5	6.9	1.8	1.0	5.3	2.8
Dec	2.5	10.5	15.6	24.8	14.9	19.4	14.1	0.9	1.9	6.0	2.5

B.









C.

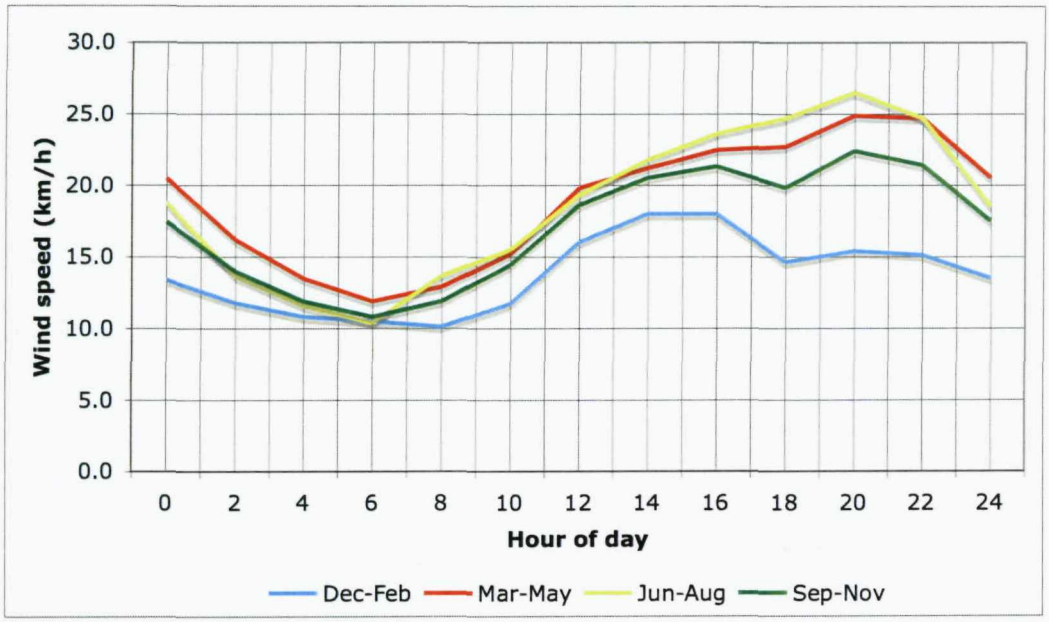
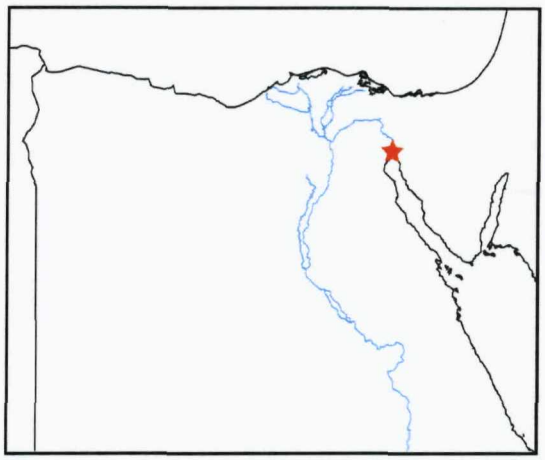

30.0
25.0
20.0
15.0
10.0
5.0
0.0
Wind speed (km/h)
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour of day
Dec-Feb
Mar-May
Jun-Aug
Sep-Nov

Table 10: Suez

Location: 29° 58' 05" N, 32° 32' 51" E.

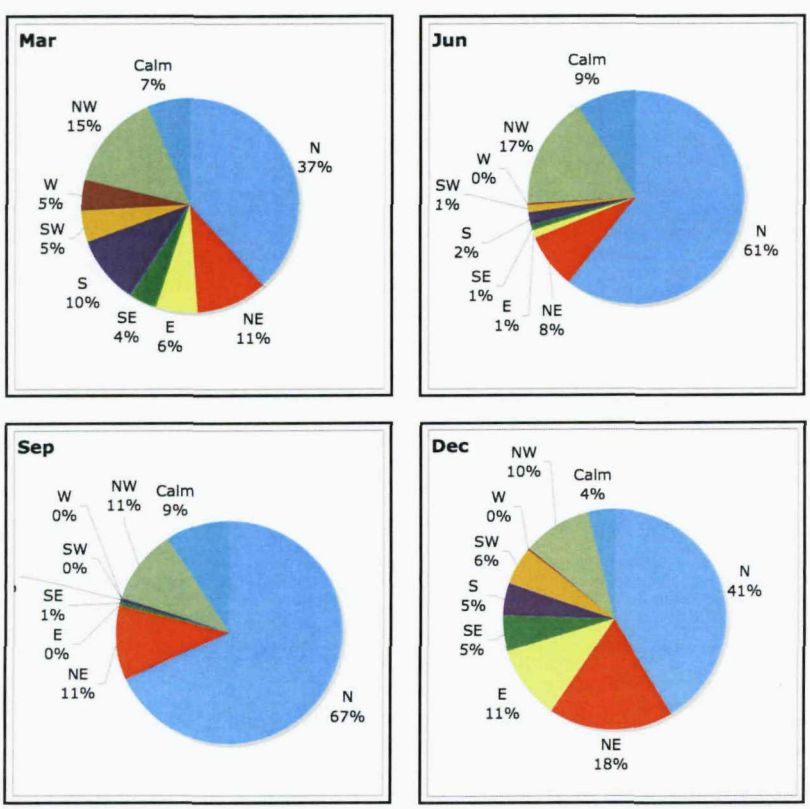


The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 29). The graph (C) overleaf shows diurnal variation in wind speed (Ministry of Public Works 1931: Plate 37).

A.

Wind	Speed		Direction (%)								
1910-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	1.4	4.0	36.3	18.5	11.1	3.4	9.5	5.4	5.9	8.8	1.1
Feb	1.4	4.0	30.8	14.4	9.4	9.0	7.8	7.9	4.6	11.7	4.5
Mar	1.4	4.0	38.2	10.8	6.0	4.2	10.2	4.7	4.8	14.6	6.5
Apr	1.4	4.0	43.4	10.2	3.7	4.4	9.2	4.4	4.3	13.6	6.7
May	1.3	3.5	58.1	7.7	0.8	2.5	5.8	1.7	1.9	13.8	7.7
Jun	1.3	3.5	60.6	8.3	0.9	0.9	2.0	1.0	0.3	17.0	8.9
Jul	1.2	3.0	63.1	9.9	1.4	0.9	1.2	-	0.2	14.5	8.8
Aug	1.2	3.0	68.3	10.6	0.9	-	-	-	-	12.7	7.5
Sep	1.3	3.5	68.2	10.7	-	0.6	0.6	-	-	10.9	9.1
Oct	1.2	3.0	57.3	11.5	2.7	1.0	3.9	0.1	1.3	12.8	9.5
Nov	1.1	2.5	45.0	19.8	6.0	3.4	5.6	2.0	1.4	8.6	8.2
Dec	1.3	3.5	40.0	17.6	10.6	4.9	4.7	5.5	0.1	9.6	3.9

B.



C.

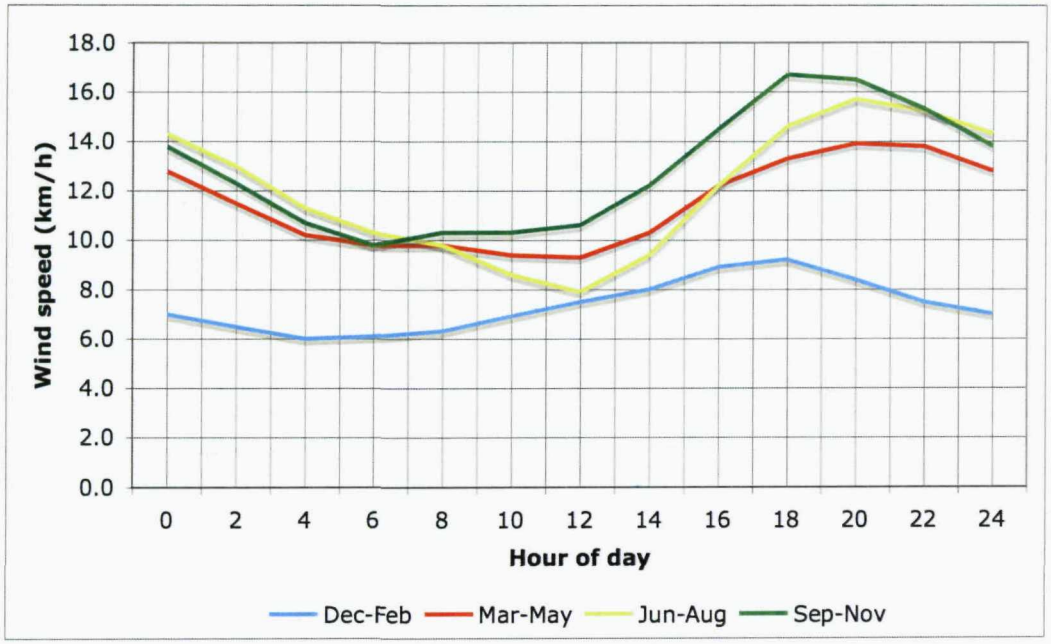
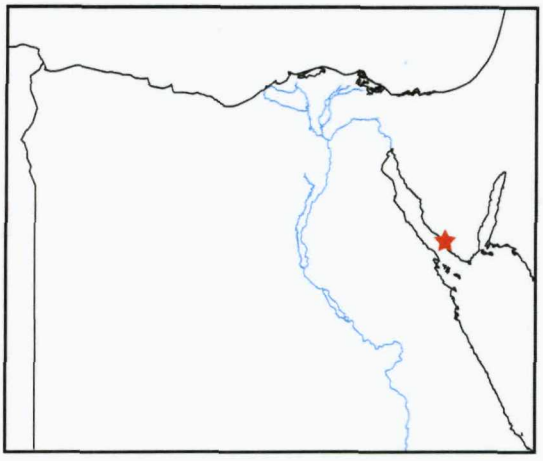

18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Wind speed (km/h)
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour of day
Dec-Feb
Mar-May
Jun-Aug
Sep-Nov

Table 11: Al-Ṭūr

Location: 28° 14' 27" N, 33° 37' 15" E.

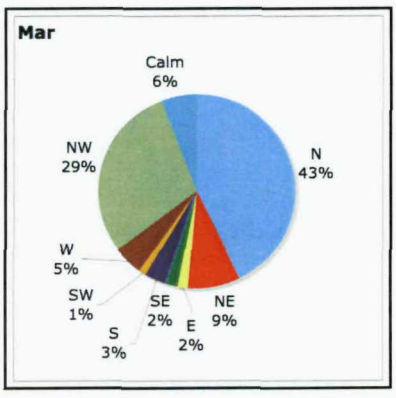


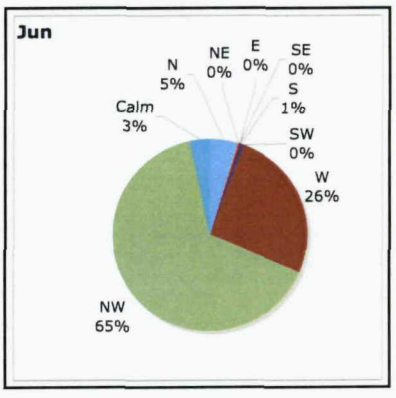
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 15).

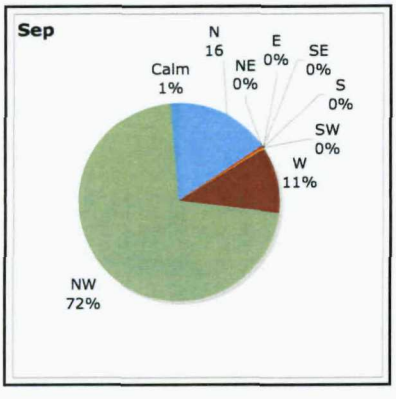
A.

Wind	Speed		Direction (%)								
1905-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	0.0	0.0	60.8	21.9	2.5	0.8	0.8	-	1.5	9.8	1.9
Feb	2.7	11.9	61.1	16.3	1.9	1.6	1.8	-	1.8	12.0	3.5
Mar	3.0	16.8	42.9	8.5	1.6	2.1	3.4	1.3	5.0	29.4	5.8
Apr	3.4	16.1	18.3	3.2	1.5	3.2	7.2	1.3	11.7	46.0	7.7
May	3.3	19.6	9.7	2.4	0.6	0.2	2.6	1.9	21.3	56.5	4.8
Jun	3.8	18.2	4.7	0.2	-	-	0.8	0.2	25.5	65.3	3.3
Jul	3.6	16.8	4.5	-	-	-	1.0	0.6	24.7	66.6	2.6
Aug	3.4	17.5	10.8	0.2	-	-	0.4	-	19.0	67.9	1.8
Sep	3.5	18.2	15.5	0.3	-	-	-	0.2	10.8	71.8	1.3
Oct	2.6	11.2	40.0	6.5	1.6	0.3	0.6	0.6	7.1	38.1	5.2
Nov	2.4	9.8	56.5	22.5	2.5	0.3	1.3	-	0.2	15.0	1.7
Dec	2.4	9.8	66.9	20.5	1.1	0.6	-	0.3	0.3	6.6	3.5

B.







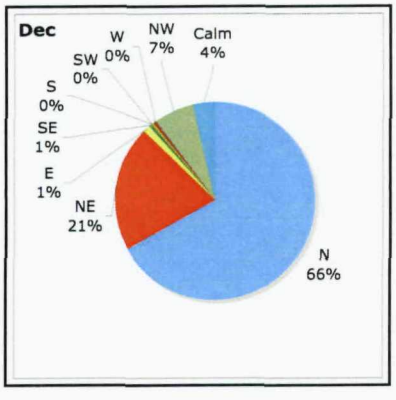
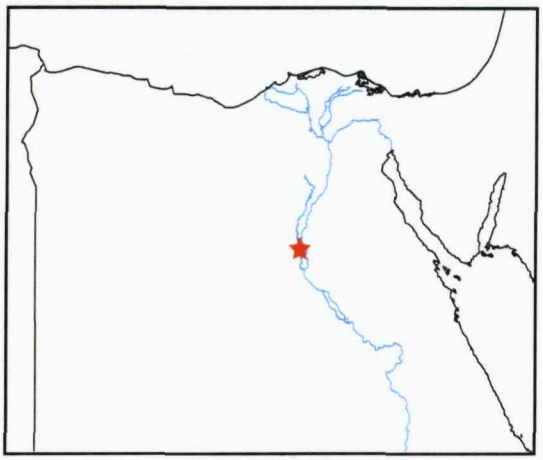


Table 13: Minyah

Location: 28° 05' 22" N, 30° 45' 27" E.

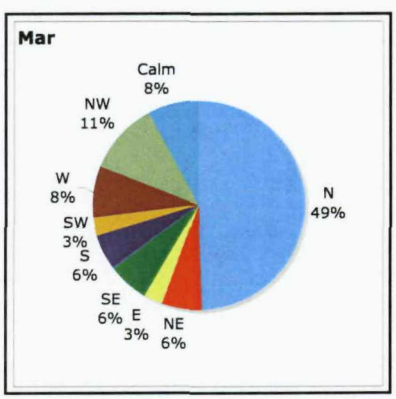


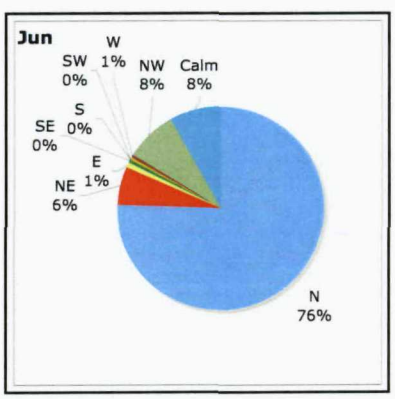
The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 29).

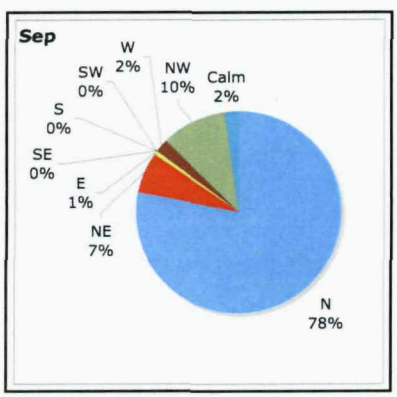
A.

Wind	Speed*		Direction (%)								
1907-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	2.3	9.1	26.7	9.7	6.1	10.0	1.4	3.6	3.6	9.3	29.7
Feb	2.6	11.2	29.7	8.7	5.9	4.5	6.1	5.3	9.6	12.0	18.8
Mar	2.7	11.9	49.6	6.1	2.7	6.3	5.6	2.9	8.1	10.9	7.9
Apr	2.8	12.6	49.1	7.8	5.6	6.7	4.6	1.7	3.9	10.4	10.4
May	3.0	14.0	60.9	5.9	2.0	4.5	0.7	1.4	2.7	6.8	15.1
Jun	3.4	16.8	75.6	6.1	0.9	0.4	-	0.2	0.7	8.0	8.1
Jul	2.9	13.3	72.9	3.0	0.4	0.7	-	0.4	1.3	14.5	6.8
Aug	2.9	13.3	81.0	2.3	-	0.4	-	1.4	0.4	8.1	6.5
Sep	3.2	15.4	78.0	6.9	0.6	-	-	-	2.2	10.2	2.2
Oct	2.3	9.1	65.9	3.2	1.6	1.1	0.4	1.8	7.3	11.1	7.5
Nov	2.2	8.4	46.7	4.3	2.0	4.3	2.8	6.5	8.5	11.3	13.7
Dec	2.0	7.0	29.7	4.8	4.3	8.2	4.3	4.7	5.9	7.2	30.8

B.







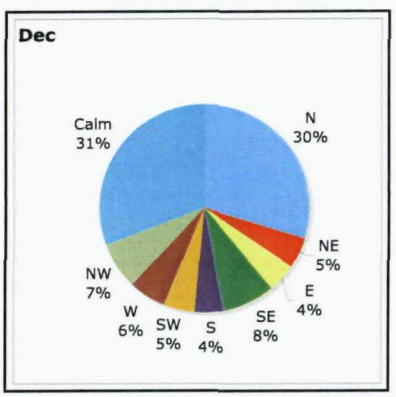
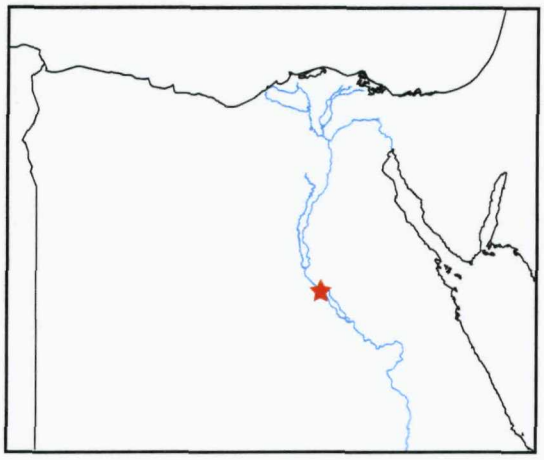


Table 14: Asyūṭ

Location: 27° 11' 07" N, 31° 11' 05" E.



The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 31).

A.

Wind	Speed*		Direction (%)								
1900-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	2.5	10.5	10.1	8.6	2.8	8.6	1.2	2.9	8.4	57.1	0.4
Feb	2.5	10.5	11.3	7.6	3.4	7.4	1.1	1.3	8.8	57.9	1.1
Mar	2.5	10.5	13.8	13.3	2.8	8.1	0.8	2.1	8.0	48.9	2.4
Apr	2.5	10.5	12.3	11.9	3.4	9.9	1.9	2.6	7.1	47.6	3.3
May	2.5	10.5	14.2	12.7	1.5	6.2	0.8	3.0	5.0	50.0	6.5
Jun	2.8	12.6	19.3	10.8	1.1	3.5	-	3.9	3.1	56.1	2.1
Jul	2.8	12.6	23.0	12.6	0.2	0.4	-	1.6	4.0	55.5	2.6
Aug	2.7	11.9	19.8	11.7	0.3	0.7	-	0.8	5.5	60.2	1.0
Sep	2.8	12.6	17.7	10.9	0.5	0.6	0.2	3.3	4.5	61.8	0.4
Oct	2.4	9.8	14.9	11.3	0.6	1.3	0.5	2.5	3.4	64.8	0.6
Nov	2.4	9.8	8.3	9.7	2.6	3.6	0.2	2.5	4.8	67.0	1.2
Dec	2.4	9.8	12.0	9.8	2.3	7.9	0.5	3.4	6.0	56.2	1.8

B.

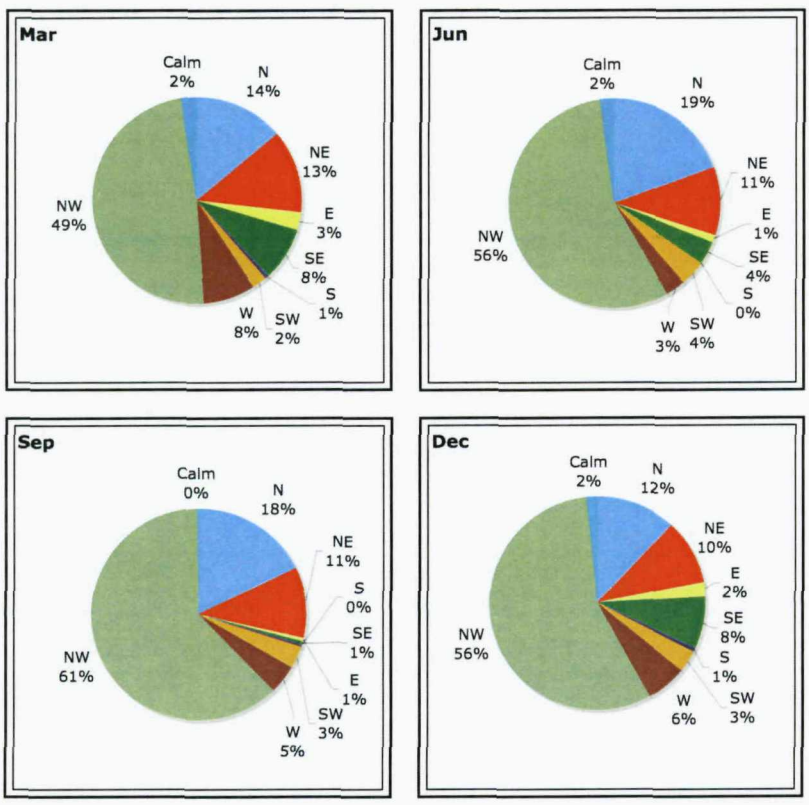
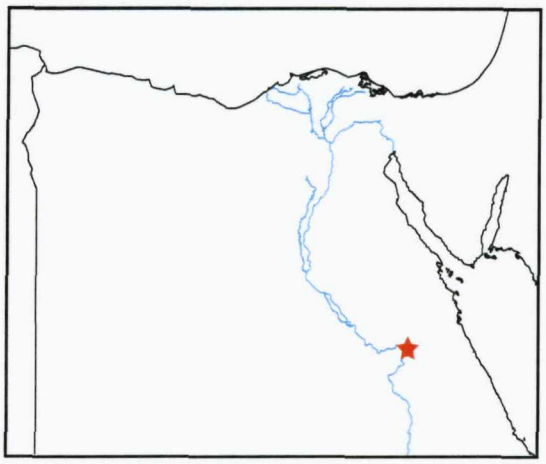


Table 15: Qīnah



Location: 26° 09' 55" N, 32° 43' 31" E.

The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The graph (B) plots the data in A (Ministry of Public Works 1922: 33)

A.

Wind	Speed*		Direction (%)								
1913-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	1.9	6.5	-	-	-	-	-	-	-	-	-
Feb	2.1	7.7	-	-	-	-	-	-	-	-	-
Mar	2.3	9.1	-	-	-	-	-	-	-	-	-
Apr	2.1	7.7	-	-	-	-	-	-	-	-	-
May	2.2	8.4	-	-	-	-	-	-	-	-	-
Jun	2.1	7.7	-	-	-	-	-	-	-	-	-
Jul	2.1	7.7	-	-	-	-	-	-	-	-	-
Aug	2.1	7.7	-	-	-	-	-	-	-	-	-
Sep	2.0	7.0	-	-	-	-	-	-	-	-	-
Oct	2.0	7.0	-	-	-	-	-	-	-	-	-
Nov	2.0	7.0	-	-	-	-	-	-	-	-	-
Dec	2.0	7.0	-	-	-	-	-	-	-	-	-

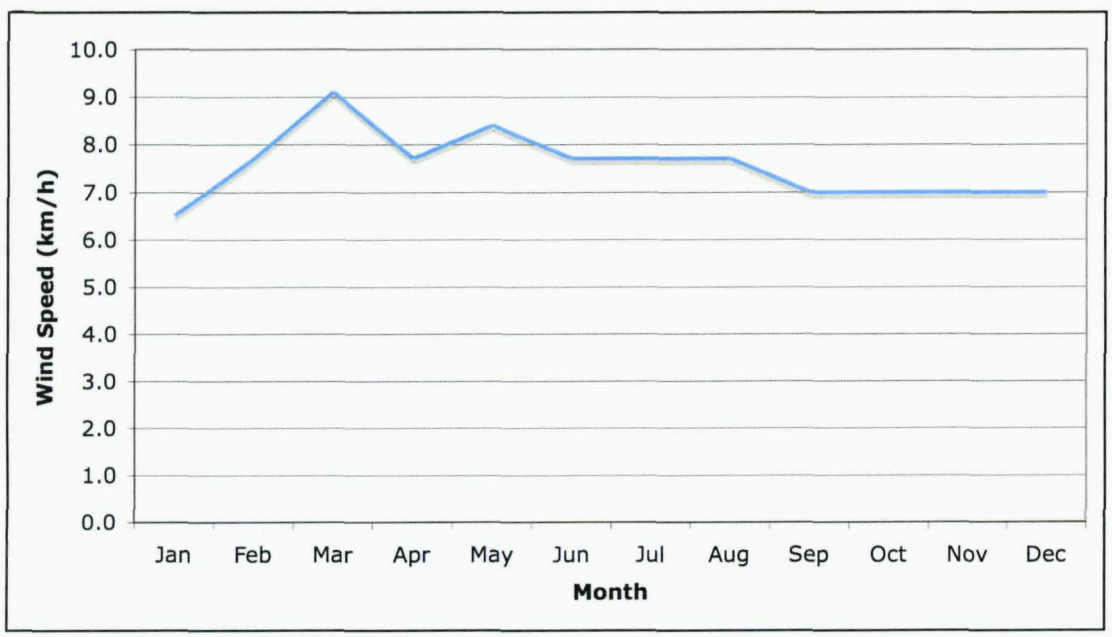
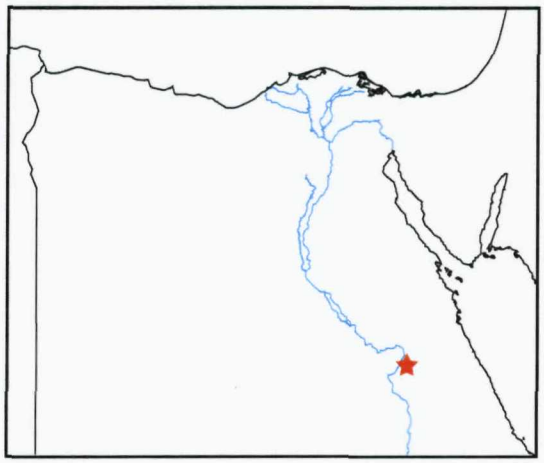


Table 16: Luxor



Location: 25° 41' 48" N, 32° 38' 36" E.

The table (A) below gives mean monthly wind strengths (means of day), mean monthly direction, and percentage calm. The graph (B) plots the data in A (Shaheen 1985: 99).

A.

Wind	Speed (km/h)	Direction	Calm (%)
Jan	6.8	N	48
Feb	7.2	N	43
Mar	7.9	NW	36.4
Apr	7.2	NW	35.9
May	7.6	NW	42.8
Jun	7.6	NW	36.1
Jul	7.2	NW	52.3
Aug	7.6	NW	41
Sep	6.9	N	29.6
Oct	5.8	N	37.9
Nov	6.1	N	46
Dec	6.5	N	45.6

B.

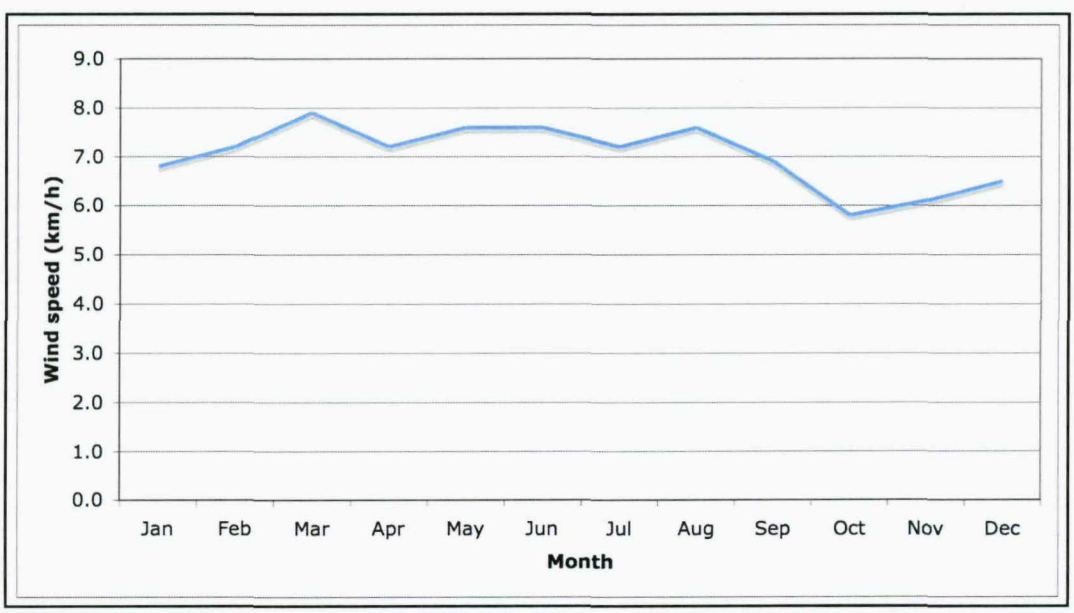
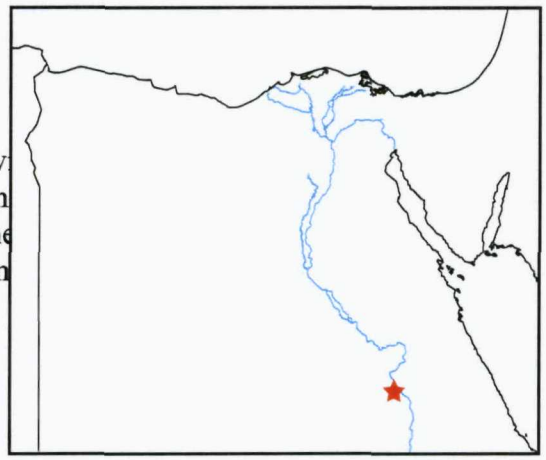


Table 17: Isnā



Location: 25° 17' 34" N, 32° 33' 13" E.

The table (a) below gives mean monthly w
strengths (means of day) and wind direction
08:00hrs. The following pie charts (B) show me
wind direction for four indicative mon
(Ministry of Public Works 1922: 35).

A.

Wind	Speed*		Direction (%)								
1907-1916	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	1.8	6.0	50.2	30.3	2.5	1.4	-	0.7	0.4	13.1	1.4
Feb	2.0	7.0	49.4	24.1	4.9	2.0	1.6	-	0.4	8.6	9.0
Mar	1.9	6.5	42.9	23.0	4.6	5.2	2.0	1.0	1.2	15.5	4.4
Apr	2.2	8.4	42.0	23.5	4.4	4.4	2.6	3.0	0.7	18.9	0.4
May	2.2	8.4	46.4	16.7	2.9	5.4	1.8	2.5	0.4	21.5	2.5
Jun	2.1	7.7	61.7	10.0	0.7	0.7	-	1.5	0.4	20.9	4.1
Jul	2.3	9.1	59.3	11.8	0.7	0.4	0.7	1.1	-	21.5	4.7
Aug	2.2	8.4	59.9	9.3	0.4	0.7	0.2	1.3	0.4	22.9	5.0
Sep	2.1	7.7	62.6	8.7	-	-	-	-	-	28.3	0.4
Oct	1.8	6.0	63.3	13.6	0.7	0.7	-	-	-	19.9	1.8
Nov	1.7	5.5	55.9	24.4	1.9	1.5	0.7	-	-	14.1	1.5
Dec	1.8	6.0	48.2	33.5	0.7	1.1	0.4	0.4	-	14.2	1.4

B.

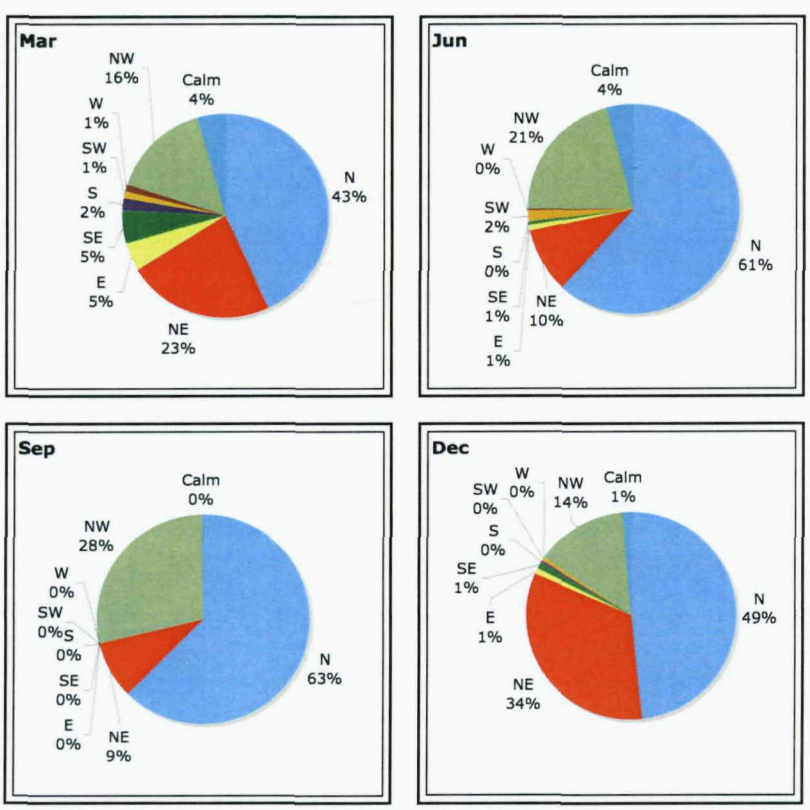
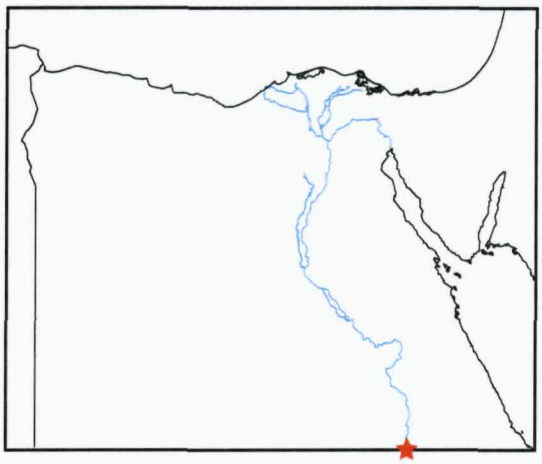


Table 18: Aswan

Location: 24° 05' 31" N, 32° 54' 18" E.



The table (A) below gives mean monthly wind strengths (means of day) and wind direction at 08:00hrs. The following pie charts (B) show mean wind direction for four indicative months (Ministry of Public Works 1922: 35).

A.

Wind	Speed*		Direction (%)								
1901-1920	Beaufort	km/h	N	NE	E	SE	S	SW	W	NW	Calm
Jan	2.6	11.2	82.4	5.2	0.2	0.2	-	0.9	0.9	4.5	5.6
Feb	2.5	10.5	79.9	6.9	0.4	-	0.9	0.4	0.2	5.6	5.5
Mar	2.6	11.2	81.2	5.5	0.9	0.4	1.4	0.6	1.0	5.0	4.0
Apr	2.7	11.9	81.3	5.7	-	0.2	2.0	1.5	0.4	5.6	3.5
May	2.6	11.2	81.8	6.4	0.2	0.4	1.2	1.4	0.9	3.6	4.0
Jun	2.7	11.9	88.8	2.4	0.2	0.2	1.2	1.0	0.2	3.7	2.4
Jul	2.5	10.5	83.0	2.5	-	0.2	0.6	1.0	1.0	5.3	6.2
Aug	2.4	9.8	76.5	3.3	0.3	0.3	0.9	2.8	1.9	7.2	6.6
Sep	2.5	10.5	83.1	4.5	-	-	0.6	0.6	0.6	6.3	4.2
Oct	2.5	10.5	85.6	9.5	0.3	0.1	0.4	0.2	0.2	2.4	1.2
Nov	2.4	9.8	87.6	6.9	0.1	0.2	0.4	-	0.6	2.9	1.2
Dec	2.4	9.8	86.7	6.0	-	-	-	0.2	0.2	2.2	4.6

B.

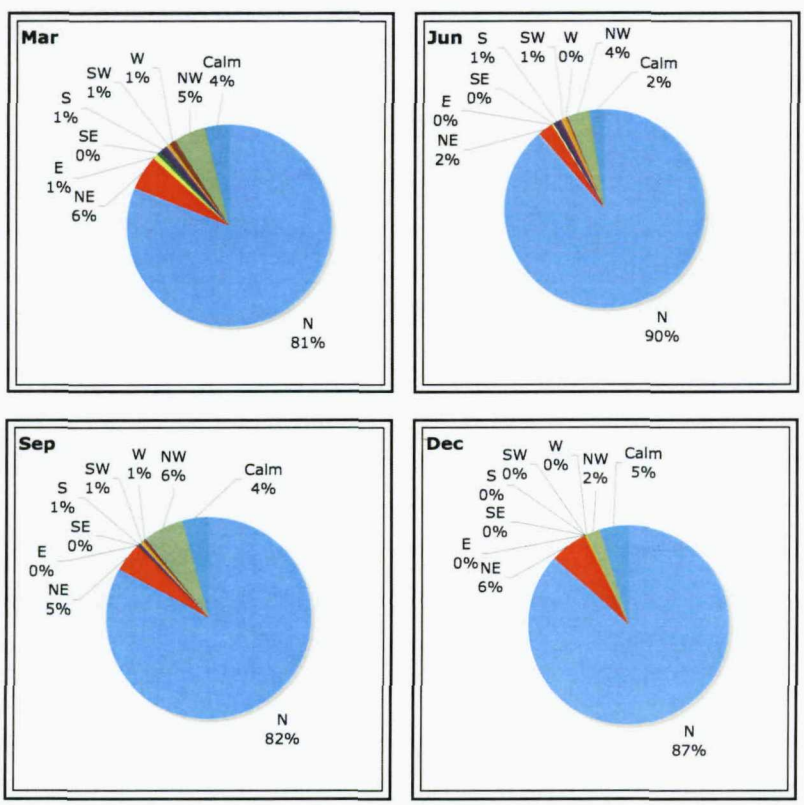


Table 19: Frequency of winds with a northerly component

The graph shows the mean percentage of winds blowing from the northerly quadrant (NW, N, NE) at locations in the Nile Delta and Upper Egypt. Data derived from tables 1-18 in this appendix.

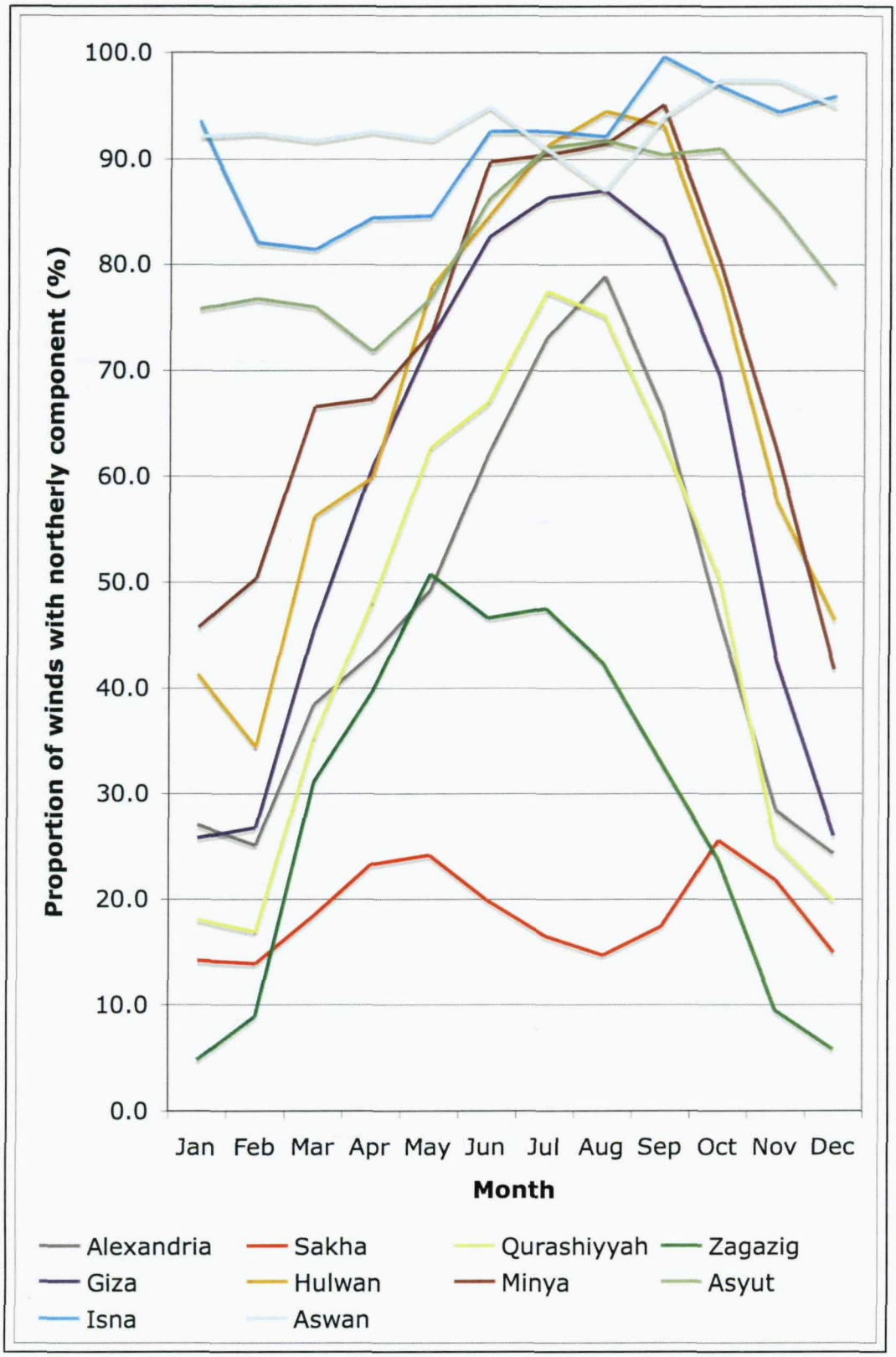


Table 20: Strength of winds

The graph shows monthly mean wind velocities at locations in the Nile Delta and Upper Egypt. Data derived from tables 1-18 and 21 in this Appendix.

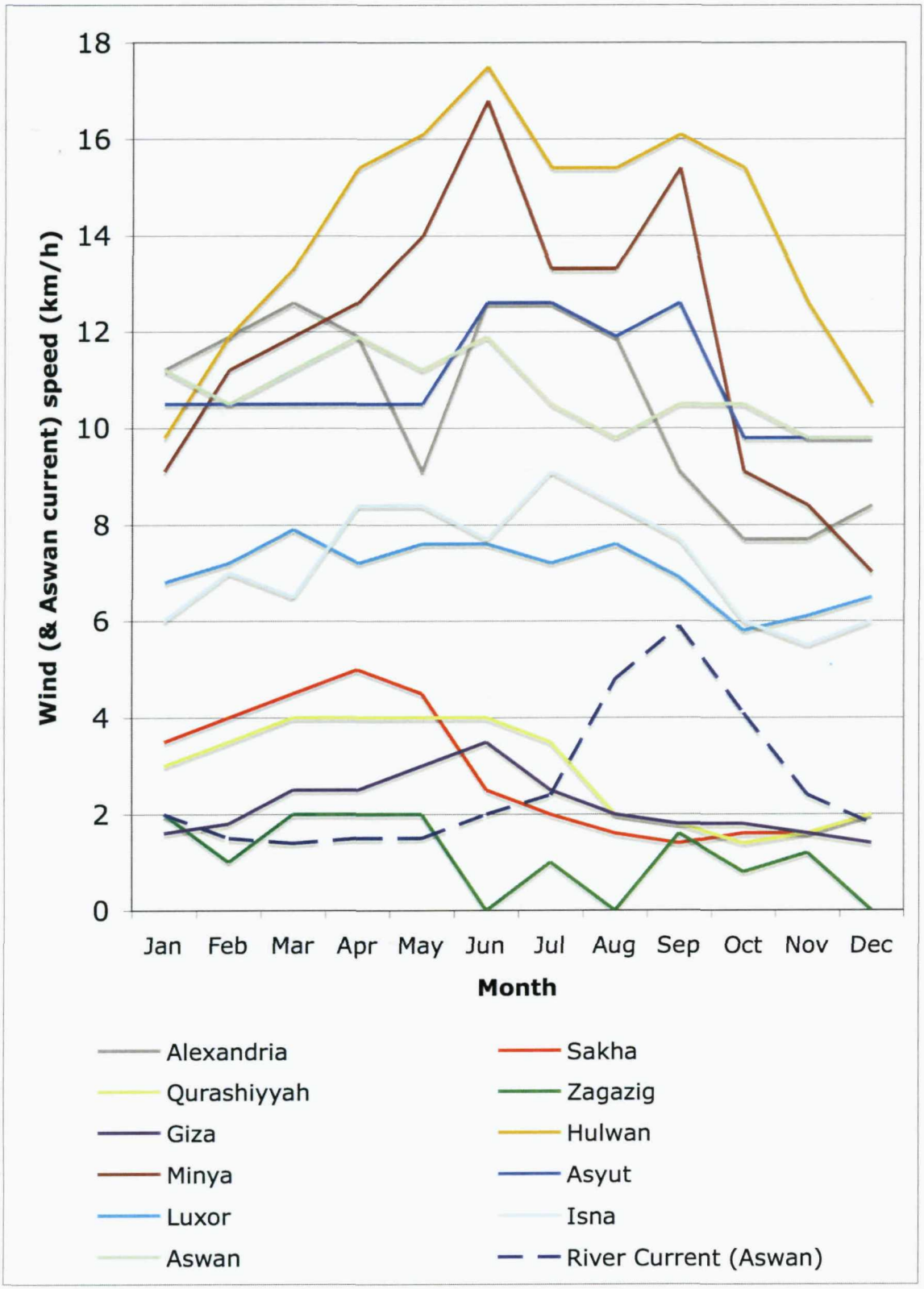
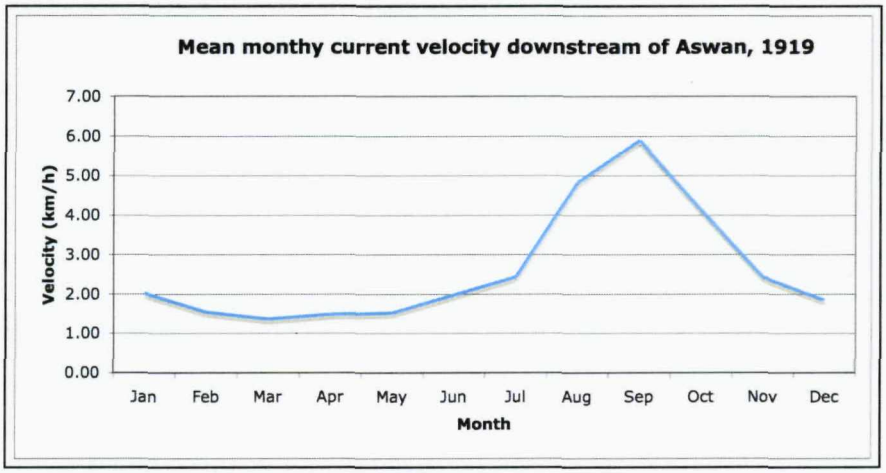


Table 21: Wind strength versus Nile current strength

Graph A shows the mean monthly velocity of the Nile current at Aswan in 1919 (Phillips 1924:8-11). Graph B shows the differential between current speed downstream of Aswan and mean wind speeds at various locations in the Nile Delta and Upper Egypt.

A.



B.