Trajan's Canal and the Logistics of Late Antiquity India Trade

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Peoples living around the Mediterranean Sea in the time before Islam were drawn by a sort of centripetal force, which meant that they tended to focus more on the internal maritime horizon of their sea than on horizons beyond it. Yet the ancient Mediterranean was no *hortus conclusus*; it had at least three gateways to the outer world. The first, largely underexploited in antiquity, linked the Mediterranean to the Atlantic world; the second, vital for the Greek world of the archaic and classical ages, connected with the Black Sea regions; and the third led to the Red Sea and the Indian Ocean. Unlike the two first gateways, the third did not possess a natural waterway joining the Mediterranean and the Indian Ocean. It comes as no surprise therefore that throughout antiquity, from the 7th century BCE to the 7th century CE, whenever the Nile valley was perceived as an integral part of a Mediterranean world, the problem emerged of how to connect the two shores of Egypt.

Different logistical solutions have been adopted at different times, or practiced at the same time, in a continuous effort to adapt to shifting requirements and conditions. Each solution had to grapple with three major environmental challenges—the sea, desert, and river—in order to link the Mediterranean and the Red Sea. The first challenge was navigating the Red Sea north of 20° north latitude line. Apart from treacherous coral reefs and unfriendly desertic shores, the northern part of the Red Sea was beset all year by winds that blew constantly from the north. As a consequence, the further north one had to sail, the more time-consuming, difficult and dangerous the navigation was.[1] The second challenge was transferring the cargoes between the Red Sea and the Nile River. For this, the further south one docked, the more laborious and expensive the crossing was. The third challenge was sailing up the Nile. During the summer the etesian winds helped, but only up to a certain point, since they weaken considerably south of Asyut.[2] It is not by chance that the ancient and

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1 F. De Romanis, *Cassia, cinnamomo, ossidiana. Uomini e merci tra Oceano Indiano e Mediterraneo*, Roma, 1996, pp. 19-31.

2 J. P. Cooper, *No easy option: the Nile* versus *the Red Sea in ancient and mediaeval north-south navigation,* in *Maritime Technology in the Ancient Economy: Ship Design and Navigation*, ed. W.V. Harris, K. Iara (Supplement of the Journal of Roman Archaeology, 84), Portsmouth, Rhode

medieval caravan roads bound for Myos Hormos, Berenice or ʻAydhāb usually started no further south than Coptos or ~~Qus~~ (Edfu during the Early Ptolemaic period was just a short-lived exception).

Different combinations of solutions for the sea navigation, desert crossing and river sailing components resulted in a variety of ways for connecting the Nile and the Red Sea. Since each combination had its positive and negative features, none was markedly better than any other. Nonetheless, each one could be deemed more suitable to a particular kind of trade. Very generally, we may say that bigger businesses required larger ships, which would not easily manage the northern part of the Red Sea. Conversely, smaller vessels, less fit for bulky cargoes, could more easily brave the navigation up to Myos Hormos and even up to Clysma, unloading their shipments nearer to the Nile.[3]

A waterway directly connecting the Nile and the Red Sea—repeatedly excavated in antiquity—minimized the desert crossing and river journey, although it required the greatest amount of sea travel and the constant maintenance of a canal linking the river to the Gulf of Suez. Such a solution, which had been ideal for the triremes of the Persian navy during part of the 6th and 5th centuries BCE, proved inadequate in the 3rd century BCE for the Ptolemaic elephant carriers (*elephantegoi*). Erected after May/June 264 BCE (l. 27), the Pithom stele triumphantly chronicles the excavation in 270/269 BCE of a canal between the Nile and Red Sea (l. 16), and then the foundation of Ptolemais *epi theron*, on the Sudanese coast, and the capture and shipment by sea and canal of elephants from Ptolemais *epi theron* (ll. 24-25).[4] This enthusiastic account by the Atum priests ignored the extreme difficulty of sending the elephant carriers up to the Suez. Both papyrological and epigraphical evidence show that, not even ten years later, elephants had to come ashore much further south (hence the establishment of a new port at Berenice, 24° lat. N) and get to Edfu on the Nile via a new caravan road.

This itinerary of sea navigation, desert caravan route, and Nile river travel—necessary for the elephant transfer—was less suitable to frankincense and aromatics merchants. Their seagoing ships, smaller than the elephant carriers, could easily sail up to Myos Hormos, from where the most direct Nilotic destination was Coptos. In the course of the second half of the second century

Island, 2012, pp. 194-201; id., *The Medieval Nile. Route, Navigation, and Landscape in Islamic Egypt*, Cairo-New York: The American University in Cairo Press, 2014, pp. 125-132. In the summer, thanks to the etesian winds (*etesiis flantibus*), the navigation from Iuliopolis to Coptos could take twelve days: Plin., *n.h.* 6.102.

3 Failing to distinguish between ships of different sizes affects, in my view, Cooper's argument (*No easy option*).

4 Urk II 81-105. A recent English translation and further bibliography in K. Mueller, *Settlements of the Ptolemies. City Foundations and New Settlement in the Hellenistic World*, Leuven – Paris – Dudley, MA: Peeters, 2006, pp. 192-199.

BCE, the Coptos-Myos Hormos nodes replaced Edfu-Berenice as the main hubs of the commercial transfer between Nile and Red Sea, and it was on that infrastructural base that the Ptolemaic and early Augustan trade in the *Erythra kai Indike thalassa* blossomed—until the discovery of the South Indian emporia, with their huge amounts of black pepper, brought back the use of very large seagoing vessels. The revival of large carriers meant in turn the resurrection of Berenice, the old destination for the Ptolemaic elephant carriers. A new caravan route emerged, connecting the first leg of the Coptos-Myos Hormos road to the last leg of the Edfu-Berenice road. Consequently, the same Nilotic emporium of Coptos served both Myos Hormos, from where smaller ships set sail to South Arabia, East Africa and Northwest India, and Berenice, which served the very large pepper carriers bound for South India.

Under Trajan, a new canal was dug between Nile and Red Sea.[5] Unlike the more or less ephemeral canals of Necho, Darius and Ptolemy Philadelphus, Trajan's canal had a very long life, becoming a permanent presence on the Red Sea in late antiquity. Such longevity is all the more remarkable insofar as it required a periodical maintenance of the canal bed and embankments was achieved by imposing annual *corvées* ~~in order to ensure~~.[6]

Ample evidence exists to show that Clysma was much more important in late antiquity than in the early imperial period.[7] Still, it is controversial how much of this development is attributable to the canal that connected the Red Sea port and the Nile. Although the commercial relevance of late antiquity Clysma is generally established, opinions differ about the utility to Clysma's traders of a canal that was not navigable all year round. It is debated, in other words, whether the canal's seasonal navigability was suited to the Indian Ocean trade schedule. It has been often claimed that the canal's navigability was, as a rule, restricted to the time when the river was at its maximum.[8] It has been consequently inferred that

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5 A tax for the excavation of the new canal is attested by SB 9545, 32 (September 2nd 112 CE); OMarbpriv (September 15th 112 CE); and probably by OCair GPW 99 (August 25th 112 CE); OEleph DAIK 18 (August 8th 114 CE); OEleph DAIK 19 (August 19th 114 CE); OWilck 89 (August 20th 114 CE); OWilck 90 (August 23rd 114 CE); OWilck 91 (July 25th- August 23rd 114 CE); O. Wilcken 92 (August 29th 113 CE-August 28th 114 CE); OBodl 871 (September 29th 114 CE). On all this, cf. A. Joerdens (with P. Heilporn's and R. Duttenhöfer's *Anhängen*), *Neues zum Trajanskanal*, in *Proceedings of the 24th International Congress of Papyrology. Helsinki, 1-7 August, 2004*, ed. J. Frösén, T. Purola, E. Salmenkivi (Commentationes Humanarum Litterarum, 122:1), Helsinki, 2007, pp. 469-485.

6 Maintenance works are attested by POxy 4070 (208 CE?); PCairIsid 81 (April 9th 297 CE); POxy 3814 (3rd-4th cent. CE); POxy 1426 (332 CE); PSI 87 (June 29th 423 CE); PSI 689a (423 CE); PSI 689b (423 CE?); PSI 689d (August 29th 420 CE-August 28th 421 CE); PWashUniv 7 (5th-6th cent. CE).

7 F. De Romanis, 'Τραιανὸς ποταμός. *Mediterraneo e Mar Rosso da Traiano a Maometto*', in *Controllo degli stretti e insediamenti militari nel Mediterraneo*, ed. R. Villari, Roma-Bari: Laterza, 2002, pp. 21-70.

8 C. Redmount, '*The Wadi Tumilat and the "Canal of the Pharaohs*"', *Journal of Near Eastern Studies* 54:2 (1995), p. 134**:** "[...] periods when the canal was functional seem to coincide with high Nile

the canal would have been of little use for a commercial enterprise that would have required too early departures and allowed too late returns.[9] It is therefore not a coincidence, as has been pointed out, that the Muziris papyrus loan contract—arguably signed after Trajan's canal was completed—expects the seagoing vessel returning to the Red Sea from Indian lands to connect to Coptos, further south than Clysma.[10]

Admittedly, Trajan's canal did not divert *all* the India trade to Clysma. In particular, it did not divert the South India trade documented by the Muziris papyrus, which was conducted with vessels too large to make the voyage up to Clysma. However, this does not preclude the hypothesis that *a large number* of the ships active in the *Erythrà thálassa* trade were attracted by the navigability of Trajan's to the northernmost reaches of the Red Sea. In the present paper, it will be argued that *Erythrà thálassa* traders could take advantage of the intermittent navigability of Trajan's canal and, consequently, that ~~Clysmas'~~ trade was favored—to some extent—by the addition of a direct water connection to the Nile. In fact, scanty but inequivocal evidence shows that commodities between Alexandria and Clysma could be transferred on water both in the summer, before seagoing vessels set out from Clysma, and in the winter, when the same ships returned to the same harbor.

r'egimes"; J.-J. Aubert, 'Aux origines du canal de Suez? Le canal du Nil à la mer Rouge revisité', in *Espaces intégrés et ressources naturelles dans l'Empire Romain: actes du colloque de l'Université de Laval-Québec, 5-8 mars 2003*, ed. M. Clavel-Lévèque and E. Hermon, Paris, 2004, p. 228: "[...] ouvert [...] mais de manière intermittente, c'est-à-dire à la saison des crues, de juillet à novembre, voire un peu au delà"; Joerdens, *Neues zum Trajanskanal*, p. 477: "Zwar wird dieser Wasserweg aller Wahrscheinlichkeit nach ohnedies nur während der Nilschwelle benutzbar gewesen sein"; F.R. Trombley, ''Amr b. al-'Ās's Refurbishment of Trajan's Canal: Red Sea Contacts in the Aphrodito and Apollōnas Anō Papyri', in *Connected Hinterlands. Proceedings of Red Sea Project IV*, ed. L. Blue, J. Cooper, R. Thomas, J. Whitewright (BAR International Series, 2052), Oxford, 2009, p. 102: "The canal was usable only in the months immediately following the rise of the Nile. The length of its operation depended on the level and duration of the flood, which sometimes lasted until January"; J.P. Cooper, 'Egypt's Nile-Red Sea Canals: Chronology, Location, Seasonality and Function', in *Connected Hinterlands,* p. 204: "[...] the canal was opened when the Nile was nearing its height, and that it must subsequently have been closed again as water levels fell"; S. Sidebotham, *Berenike and the Ancient Maritime Spice Route*, Berkeley, Los Angeles, London: University of California Press, 2011, p. 181: "Later evidence suggests that the canal was not used perennially, but functioned only during the Nile's inundation season—from sometime in September to December/January. Thus, use of the canal would not have been in sync with departure times of ships from the Red Sea ports for destinations in India".

9 Cooper, *Egypt's Nile-Red Sea Canals*, p. 205; J.-J. Aubert, 'Trajan's Canal: River Navigation from the Nile to the Red Sea?' , in *Across the Ocean. Nine Essays on Indo-Mediterranean Trade*, ed. F. De Romanis, M. Maiuro, Leiden – New York: Brill 2015, pp. 38-41.

10 Aubert, 'Trajan's Canal: River Navigation from the Nile to the Red Sea?', pp. 37-38. However, the Muziris papyrus sets an example valid only for the South India trade, conducted with ships of very large size.

It is self-evident that Trajan's canal must have been navigable when the water level of the Nile was at its peak and inaccessible when the river was at its lowest. It is sometimes claimed, though, that navigability began *only after* plenitude, which would leave very little time for a departure by the end of September. Such a notion is based on the assumption that in antiquity (when the canal was intermittently navigable) as well as in medieval times (when the canal was never navigable) water was released into the canal only after the river had reached its height.[11] In the middle ages earthen dams, annually constructed, prevented the Nile from inflowing into the canal before plenitude was attained.[12] However, there is no proof that the medieval practices of water management, aimed at irrigating villages of the lower delta, extended back to the Roman period, when there is no evidence for such a procedure, and when the imperial administration had opposite concerns.[13] At any rate, an indication that Trajan's canal *did* allow vessels to reach Clysma on time is given by a well-known passage of Lucian's *Alexander or the False Prophet*:

> ἀναπλεύσας ὁ νεανίσκος εἰς Αἴγυπτον ἄχρι τοῦ Κλύσματος, πλοίου ἀναγομένου ἐπείσθη καὶ αὐτὸς εἰς Ἰνδίαν πλεῦσαι, κἀπειδήπερ ἐβράδυνεν, οἱ δυστυχεῖς ἐκεῖνοι οἰκέται αὐτοῦ, οἰηθέντες ἢ ἐν τῷ Νείλῳ πλέοντα διεφθάρθαι τὸν νεανίσκον ἢ καὶ ὑπὸ λῃστῶν—πολλοὶ δὲ ἦσαν τότε—ἀνῃρῆσθαι, ἐπανῆλθον ἀπαγγέλλοντες αὐτοῦ τὸν ἀφανισμόν.[14]

[11] Trombley, *'Amr b. al-'Ās's Refurbishment of Trajan's Canal*, p. 102: "The canal was usable only in the months immediately following the rise of the Nile [...] Al-Muqaddasī mentions the dams that blocked the canal until its annual opening at the time of the Christian festival of the Exaltation of the Cross (conventionally dated 14 September in the medieval Coptic calendar of festivals)"; Cooper, *Egypt's Nile-Red Sea Canals*, p. 204: "Little is known of the navigational functioning of Persian and Ptolemaic canals that rose near Bubastis. However, their Roman and Arab successor, even enjoying an apparently superior offtake some 65 km further upstream, was almost certainly only navigable on a seasonal basis. The ceremonies marking its annual opening—with the breaking of a dam at its mouth in Cairo—are recorded by Islamic-era authors, who in turn attribute pre-Islamic origins to them. In the early centuries of Islam, these ceremonies took place at 'Ayn Shams (Heliopolis) on the Christian festival of the Veneration of the Cross, the Coptic version of which occurs on the seventeenth day of the month of Tūt in the Coptic calendar, corresponding to 14th September of the Julian calendar".

[12] W. Popper, *The Cairo Nilometer. Studies in Ibn Taghrî Birdî's Chronicles of Egypt: I*, Berkeley and Los Angeles: University of California Press, 1951, pp. 82-87.

[13] K. Blouin, *Triangular Landscapes. Environment, Society, and the State in the Nile Delta under Roman Rule*, (Oxford Studies on the Roman Economy), Oxford, 2014, p. 34: "[...]in the second century AD, a series of local, regional and, perhaps too, deltaic transverse waterways facilitated the movements of goods and people within Lower Egypt [...] The digging [...] of such large-scale waterways implies the diversion of important quantities of water into their course and, consequently, a drop of the water draft in the deltaic network and the silting of the more sluggish branches".

[14] Luc., *Alex.* 44.

It does not seem appropriate to minimize the value of this passage. Even if it did not refer to a real event and was only "a fictional narrative" made up by a Greek satirist, *it should be acknowledged that Lucian makes the effort to explain in realistic terms* (πολλοὶ δὲ ἦσαν τότε) *the development of the story. Besides, one should not rule out the possibility that Alexander or the False Prophet was written during or after Lucian's stay in Alexandria, when he could very well have known how local merchants reached Clysma.*[15] Although it can be wondered for where exactly the ship was bound, we have no reason not to believe that the text proves that *it was possible to sail from Alexandria to Clysma early enough to get on board ships bound for, allegedly, India.*

On the other hand, there is also evidence to show that when Clysma's ships landed back at their home harbor, Trajan's canal could be still navigated. The first piece of evidence is in a passage of Epiphanius' of Salamis *Panarion*. His overview of the Roman ports in the Red Sea carries the authority of the author's origin from Palaestina and lengthy residence in Egypt.[16]

> ὅρμοι γὰρ τῆς Ἐρυθρᾶς θαλάσσης διάφοροι, ἐπὶ τὰ στόμια τῆς Ῥωμανίας διακεκριμένοι, ὁ μὲν εἷς ἐπὶ τὴν Αἰλᾶν [...] ὁ δὲ ἕτερος ὅρμος ἐπὶ τὸ Κάστρον τοῦ Κλύσματος, ἄλλος δὲ ἀνωτάτω ἐπὶ τὴν Βερνίκην καλουμένην, δι' ἧς Βερνίκης καλουμένης ἐπὶ τὴν Θηβαΐδα φέρονται, καὶ τὰ ἀπὸ τῆς Ἰνδικῆς ἐρχόμενα εἴδη ἐκεῖσε τῇ Θηβαΐδι διαχύνεται ἢ ἐπὶ τὴν Ἀλεξανδρέων διὰ τοῦ Χρυσορρόᾳ ποταμοῦ, Νείλου δέ φημι, τοῦ καὶ Γεὼν ἐν ταῖς γραφαῖς λεγομένου, καὶ ἐπὶ πᾶσαν τῶν Αἰγυπτίων γῆν καὶ ἐπὶ τὸ Πηλούσιον φέρεται· καὶ οὕτως εἰς τὰς ἄλλας πατρίδας διὰ θαλάσσης διερχόμενοι οἱ ἀπὸ τῆς Ἰνδικῆς ἐπὶ τὴν Ῥωμανίαν ἐμπορεύονται.[17]

Epiphanius mentions only three ports: Aila and Clysma, which are ἐπὶ τὰ στόμια τῆς Ῥωμανίας διακεκριμένοι, and Berenice that lays ἀνωτάτω.[18] As a consequence of the distant locations of the two groups of ports, the Indian commodities are poured *either* over the Thebaid *or* over Alexandria, the whole of Egypt, and Pelusium. The disjunctive conjunction ἤ makes clear that in Epiphanius' view Thebaid on one side and Alexandria, the whole land of Egypt,

[15] Lucian held office in Egypt (Luc., *Apol.* 12), while he was writing his *Apologia* ἐν γήρᾳ — ὑστάτῳ (4). *Alexander or the False Prophet* was written after Marcus Aurelius' death (Luc., *Alex.* 48).

[16] Soz., *h.e.* 6.32.3: Ἐπιφάνιος δὲ ἀμφὶ Βησανδούκην κώμην ὅθεν ἦν, νομοῦ Ἐλευθεροπόλεως. ἐκ νέου δὲ ὑπὸ μοναχοῖς ἀρίστοις παιδευθεὶς καὶ τούτου χάριν ἐν Αἰγύπτῳ πλεῖστον διατρίψας χρόνον ἐπισημότατος ἐπὶ μοναστικῇ φιλοσοφίᾳ γέγονε παρά τε Αἰγυπτίοις καὶ Παλαιστίνοις κτλ.

[17] Epiphanius, *panarion* III 16-17.

[18] Epiphanius does not mention any port that may be identified with the 4th century CE military installation (converted into a church in the next century) at Abū Sha'ār, whose epigraphic evidence suggests, though, some commercial role: Sidebotham, *Berenike and the Ancient Maritime Spice Route*, pp. 182-184.

and Pelusium on the other, are alternative destinations for the Indian commodities depending on which Red sea port they used to enter Egypt. The ships that landed at Berenice sent their cargoes across the caravan roads of the Eastern desert to the Thebaid; those that reached Clysma were sent to the other Egyptian destinations "through the Chrysorrhoas River that is the Nile". There is no doubt that here a navigation through the *Traianos potamos* is suggested. It is therefore apparent that around 375 CE ships loaded with Indian goods arrived at Clysma and proceeded through the *Traianos potamos* up to Alexandria, the rest of Egypt and Pelusium.

Almost two centuries after Epiphanius' *Panarion*, evidence for the movement of Indian commodities through Trajan's canal is provided by a pertinent passage in Olympiodorus' of Alexandria commentary to Aristoteles' *Meteorology*.

> τὰ γὰρ αὐτὰ πλοῖα πλείω φόρτον βαστάζουσι ἐπὶ θαλάττης ἤπερ ἐπὶ λίμνης. ἀμέλει διὰ ταύτην τὴν αἰτίαν πολλοὶ ἰνδικοπλεῦσται ναυαγοῦσι μὴ εἰδότες τοῦτο. καὶ ἐν μὲν θαλάσσῃ γεμίζουσιν αὐτὰ φόρτου, καὶ ἡ μὲν θάλασσα διὰ τὸ γεῶδες αὐτῆς ἀνωθεῖ καὶ βαστάζει· ἔρχονται δὲ ἐν ποταμοῖς ἢ λίμναις καὶ ναυαγοῦσι διὰ τὸ μὴ ἔχειν οὕτως τὸ γεῶδες ἐκ τῆς καπνώδους ἀναθυμιάσεως καὶ μὴ δύνασθαι ἀνωθεῖν. ἴσως δὲ δυνατὸν καὶ τὴν καπνώδη ἀναθυμίασιν ὡς ἀνωχοῦσαν διὰ τὸ σπεύδειν ἐπὶ τὸ συγγενὲς χωρεῖν, ἐν τῇ θαλάσσῃ μείζονα τὰ πλοῖα τὰ αὐτὰ πλείω φόρτον βαστάζοντα.[19]

There is no need to emphasize that Olympiodorus was in a position to know very well how Indian commodities were transferred from the Red Sea to the city in which he lived. In order to demonstrate that fresh water is less dense ("has not as much *geodes*") than sea water, Olympiodorus refers to the frequent accidents by Indian Ocean seafarers (ἰνδικοπλεῦσται), who loaded their ships to the maximum limit allowed by the sea waters. When they came to sail in canals or other water bodies (ἐν ποταμοῖς ἢ λίμναις), they sank because of the fresh water's inferior buoyancy. The uninterrupted navigation of Indian Ocean seafarers, first by sea and then by canal and other water bodies, shows that Olympiodorus alludes to a shipment *entirely by water* from the Red Sea to Alexandria.[20]

As stated, it is certain that Trajan's canal was not navigable all year round. Certainly it was not navigable when the Nile was at its shallowest (see fig. 1) and maintenance work took place. In 297 CE, they lasted at least two months after

[19] Olymp., *in mete.* 81.

[20] For the term λίμνη denoting water bodies of the Nile delta, cfr. Blouin, *Triangular Landscapes*, p. 135.

April 9th.[21] In 424 CE, they lasted three months, possibly starting from Pharmouthi 1st (March 26th) or slightly later.[22]

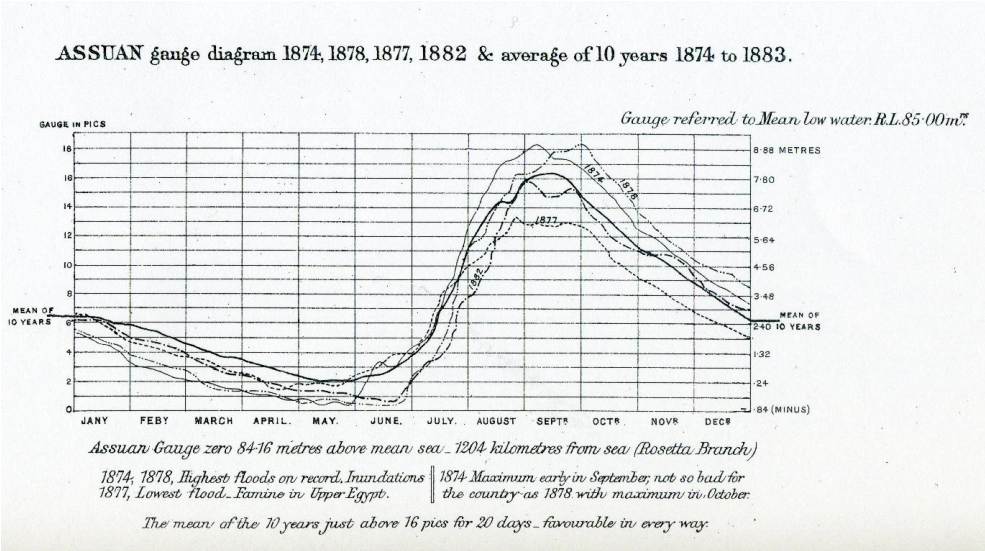

Fig. 1. From W. Willcocks – J.I. Craig, *Egyptian irrigation*, London, 1913[3], p. 182

By contrast, it is open to question how many of the remaining two hundred and seventy-five days Trajan's canal was navigable. In this respect, the clearest indication is provided by a papyrus dating back to 710 CE, therefore referring to the canal after it was reopened by ʿAmr b. al-ʿĀs.

> ἔσῃ γὰρ ἐπιστάμενος ὡς <ἐὰν> ὑστερήσῃ(ς)| τὸ ὁτιοῦν ἔκ τε τῶν αὐτῶν εἰδῶν καὶ δαπανῶν| καὶ γένηται ἀπόβασις τῶν ὑδάτων μέλλεις ταῦτα διὰ στράτας| βαστάξαι ἕως τοῦ αὐτοῦ Κλύσματος παρέχων τὸ φόρετρον| αὐτῶν ἐξ ἰδικῆς σο\υ/ ὑποστάσεως.[23]

These lines come from a letter in which Qurra b. Sharik, governor of Egypt, urges Basilios, *dioiketes* of Aphrodito, to convey as soon as possible, before the waters of Trajan's canal recede, what had been already requested in terms of provisions for the ships in Klysma: should Basilios fail to deliver what is due while the canal was

21 SB 7676.

22 PSI 689a, l. 5: χρ(ε)ίαν τῆς τριμήνου; l. 10: ἐργάσασθαι ἐπὶ χρόνον μῆνας τρῖς. It is unclear if in June 29th 423 CE (PSI 87) the three-month service was over.

23 PLond 1346, ll. 16-20.

still navigable, Qurra warns, Basilios will pay the expensive land transport up to Clysma.[24]

The letter is dated January 3rd (Gregorian 7th) 710 CE and was received on February 9th (Gregorian 13th). Therefore, the sentence ἐὰν—γένηται ἀπόβασις τῶν ὑδάτων cannot refer to the beginning of the drop in water level, but must denote the moment when the water level had become so low as to hinder all sailing.[25] This was not the first letter sent by Qurra to Basilios on that matter in that year,[26] nor probably, was it the last.[27] The pressing overtones urging for a prompt action suggest that Qurra was aware that his letter might not be delivered as soon as it was desirable.[28] The thirty-seven days that elapsed between the writing and delivery of PLond 1346 are definitely more than the ten days between the writing and delivery of PLond 1351 and PRossGeorg 4, 16, but they are less than the forty-three days of PLond 1341, and much less than the fifty-nine days of PLond 1379. Nothing suggests that Qurra's demand was preposterous or that the flood was exceptionally late that year and since we have no reason not to assume that PLond 1346 reflects the normal operational pattern of the connections between Clysma and the Nile, we must conclude that Trajan's canal remained navigable well beyond January 3rd. This may not have been sufficient for the South India traders, who had to leave for Egypt in December at the earliest.[29] It is not unlikely, however, that other "Indian Ocean seafarers" could take advantage of the canal's navigability in late winter. Information about the logistics of the India trade in late Antiquity can be inferred from a well-known passage of the *Martyrium Arethae.*

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[24] A road from Babylon to Clysma is attested by the *Itinerarium Antonini* 169, 2 and partially confirmed by CIL III 6633 = ILS 657.

[25] For a difference between the beginning of the drop and the end of the navigability period, cfr. SB 10459 l. 11-12: ἤδη γὰρ ἤρξατο ἀποβαί[νειν τὸ ὕδωρ τοῦ Τραιανοῦ],|[ἐπ]ᾐ ἐὰν ἀποβῇ τὸ ὕδωρ ὡς εἴρηται ε̣[̣]ρ[

[26] Cfr. PLond 1346, ll. 4-11: ἧμεν/ διαστείλαντες διὰ τῆς διοικήσεώς σο\υ/ διάφορα εἴδη|λόγῳ φιλοκαλείας καὶ ἐξαρτίας πλοίων τοῦ Κλύσμα(τος) |ἔτι μὴν καὶ δαπάνην ναυτῶν πλοίων ὄντων ἐν τῷ αὐτῷ|Κλύσματι ἀποστείλαντες πρὸς' σὲ καὶ τὰ τούτων ἐντάγια|πρὸ ἡμερῶν πολλῶν γράψαντες ταῦτα διὰ συντομίας|ἐκπέμψαι πρὸ τοῦ γένηται ἀπόβασις τῶν ὑδάτων τοῦ Τραιανο\ῦ/|καὶ μέχρι τῆς δεῦρο οὐκ ἔπεμψας τί' ποτε ἐκ τούτων ἄξιον λόγο\υ/.

[27] Fragments of other letters by Qurra on the same subject are SB 10459, PLond 1465 and, in Arabic, B.M. Or. 6232 (2). PLond 1465 l. 4: τὸ τέταρτον ἐτάξαμεν διὰ τῆς δι[οικήσεώς σου suggests that they may all belong to the same eight *indictio* (709/710). It seems that Basilios did not succeed, cfr. PLond 1465 l. 1-2: ἐγένετο ἀπόβασις τῶν ὑδάτων τοῦ Τραιανοῦ τοῦ βαστάξαι αὐτὰ διὰ γῆς ἕως το[ῦ] αὐτοῦ Κλ[ύσματος.

[28] PLond 1346, ll. 12-16: δεχόμενος οὖν τὰ παρόντα γράμματα εὐθέως καὶ κατ' αὐτὴν| τὴν ὥραν πέμψον εἴ τί ἐστι διὰ τῆς διοικήσεώς σο(υ)| ἐξ αὐτῶν μὴ ὑστερῶν τι τὸ σύνολον μήτε μὴν δεόμενος| ἑτέρων ἡμῶν γραμμάτων περὶ τούτο(υ) ἐὰν μέντοι συνιεῖς| καὶ ἔχεις φρένας.

[29] Plin., *n.h.* 6.106: ex India renavigant mense Aegyptio Tybi incipiente, nostro Decembri, aut utique Mechiris Aegyptii intra diem sextum, quod fit intra idus Ianuarias nostras.

> Κατ' οἰκονομίαν δὲ τοῦ σωτῆρος ἡμῶν Ἰησοῦ Χριστοῦ εἰσῆλθον πλοῖα τῶν ἐμπόρων Ῥωμαίων καὶ Περσῶν καὶ Ἰνδῶν καὶ ἐκ τῶν νήσων Φαρσὰν ἑξήκοντα, οὕτως· ἀπὸ μὲν Ἀειλᾶ τῆς πόλεως πλοῖα δεκαπέντε, ἀπὸ δὲ τοῦ Κλύσματος εἴκοσι, ἀπὸ Ἰωτάβης ἑπτά [ἀπὸ Ἰωτάβης δύο **A**], ἀπὸ Βερονίκης δύο [ἀπὸ Βερονίκης ἑπτά **A** *ante* ἀπὸ Ἰωτάβης], ἀπὸ Φαρσὰν ἑπτά, ἀπὸ Ἰνδίας ἐννέα.[30]

We may assume that the traditional route timings to Adulis were beneficial to the divine providence in assembling all those ships from so many different places. We may also assume that (as far as the trade between Egypt and India is concerned) the role of Adulis in late Antiquity was similar to that of Aden in medieval times: it was the place where the Indian commodities passed from the Arabian Sea ships to those bound for the other Red Sea ports. Out of the sixty ships that anchored in the port of Adulis in 524 CE, those from Clysma were as many as twenty, those from Aila fifteen, those from Iotabis seven, those from Farasan Islands also seven, those from Berenice two and those from India nine. The text says nothing about the size of the ships, but it seems likely that the nine ships from India were of much larger size than the thirty-five from Clysma and Aila that had to sail the Red Sea all the way up to its northernmost shores. It seems likely, in other words, that the difference in size between the ships from Clysma and Aila on one side and those from India on the other was comparable to the difference, in pre-Portuguese times, between the ships that exported spices from Calicut to Aden on one side and those that re-exported part of the same spices from Aden to Toro on the other.[31]

The winter anchorage in Adulis of ships from Clysma, Aila and India[32] suggests that the ships from India had arrived from north-west India in *early winter*, sailing during what the rasulid almanacs call the *dīmānī* season. In fact, timetable of the sea routes between Adulis and India could hardly radically depart from the sailing seasons between India and Aden as described in the rasulid almanac

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[30] *Martyrium Arethae* 29. For an evaluation of the passage, see V. Christides, 'What went wrong in the long distance Roman naval power', in *Graeco-Latina et Orientalia. Studia in honorem Angeli Urbani heptagenarii*, ed. S. Kh. Samir and J.P. Monferrer-Sala (Syro-Arabica, 2), Cordoba: Oriens Academic, 2013, p. 75.

[31] Duarte Barbosa, *Livro em que dá relação do que viu e ouviu no Oriente*, Lisboa, 1946, pp. 160-161: "Estes no tempo que prosperaram nos seus tratos e navegação, faziam nesta cidade naus de quilha de mil e mil duzentos bahares de cárrega [...] partiam desta cidade cada monção dez e quinze naus destas para o mar Roxo, Adem e Meca, onde vendiam muito bem suas mercadorias. Algumas ha hos mercadores de Juda, que dahy has leuauaom em pequenos nauios ha ho Toro, e do Toro hiaom ha ho Cairo". Apparently, the Toro ships were smaller ('em pequenos nauios'), than the Calicut ships, whose tonnage—within 200 tons—was also rather modest.

[32] *Martyrium Arethae* 29: πεποίηκε δὲ καὶ αὐτὸς Ἰνδικὰ δέκα πλοῖα ἐν τῷ χειμῶνι [ἐν τῷ αὐτῷ χειμῶνι AHKDP] τῆς αὐτῆς τρίτης ἰνδικτίονος, φιλοκαλήσας τὰ ἑβδομήκοντα.

written in 1271 CE by the Yemeni sultan al-Malik al-Ashraf 'Umar ibn Yūsuf, where a distinction is made between a *dīmānī* season (early winter monsoon) and a *tīrmāh* season (late winter monsoon). The ships that sailed according to the *dīmānī* season were supposed to leave India—actually North-West India—on October 16th, to arrive at Aden between November 6th and December 21st, and to start they return voyage between March 26th and May 6th[33] This schedule does not apply to South India, off of which the unfavorable South-West monsoon keeps blowing at least until November 15th (see fig. 2). In the first century CE, ships bound for Egypt used to leave between December and January 13th.[34] In medieval times, Calicut ships left for Aden as late as February/March.[35] In al-Ashraf's almanac, ships from South India sailing with the *tīrmāh* season reach Aden by April 15th and leave from there by August 21st.[36]

[33] D. M. Varisco, *Medieval Agriculture and Islamic Science. The Almanac of a Yemeni Sultan*, Seattle and London: University of Washington, 1994, pp. 23, 25, 27, 31, 33 (English translation); 42, 43, 45, 50, 52 (Arabic text).

[34] Cf. *supra* nt. 29.

[35] F. De Romanis, 'Time to Repay a Maritime Loan: A Note on SB III 7169 and SB XVIII 13167 Recto', *Sileno* 40 (2014), pp. 83-89.

[36] Varisco, *Medieval Agriculture and Islamic Science*, pp. 32 (English translation), 51 (Arabic text).

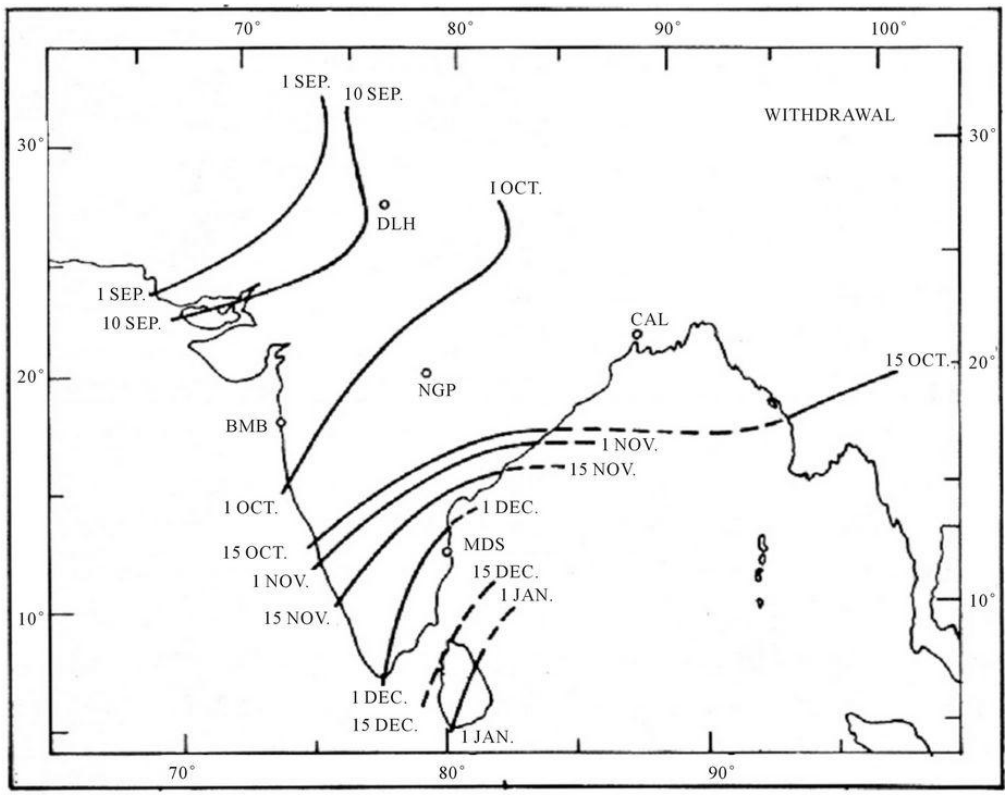

Fig. 2. Normal dates of end of SW Monsoon (Source: IMD)

An arrival at Adulis any time in November/December would have left enough time for the Clysma ships to re-export the Indian commodities to their home port while Trajan's canal was still navigable. Conversely, those ships returning from South India and Sri Lanka reached Adulis too late for their cargoes to be transferred via Trajan's canal. Along with the Thebaid demand for Indian commodities, the persistence of trade activities in Berenice during late Antiquity owes not a little to the delayed timing of the oceanic crossing from South India.