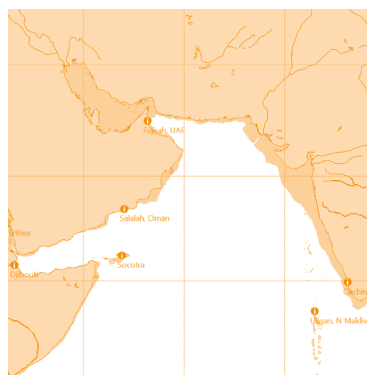


Hippalos and the direct sea route to India: conditions and circumstances of the so-called discovery



Abstract: One of the most important questions concerning Indo-Roman trade relations still in need of resolution is whether the discovery of the transoceanic sea route to India was a gradual process, building on years of navigational experience, or a one-time event that threw the seas open to sailing on a commercial scale. Historians tend to focus on the who and when of that first open-sea passage, without going into the boundary conditions necessary for such a voyage or the circumstances that made it actually possible. In the case of the open-sea route to India, a circumstance of significance for the issue is the ransacking of the port of Arabia Eudaemon (today's Aden on the southern Yemeni coast), which had been an essential stopover for ships plying the trade between Egypt and India. With the port out of operation in the 1st century AD—this according to the navigational guide *Periplus Maris Erythraei*—and a tentative blockade on inshore sailing in this part of Bab el-Mandeb (which indeed the *Periplus* does not mention), the resumption of active trade with India necessitated the discovery of a transoceanic route that would avoid troubled waters. This paper specifically considers the conditions and circumstances that would have stood behind the discovery of a transoceanic route across the Indian Ocean.

Keywords: ancient navigation, astronavigation, Roman trade, tradwe in the Indian Ocean, ancient discoveries

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INTRODUCTION

A direct sea route from Roman Egypt to India is one of the most fundamental issues in the Indo-Roman trade relationship and yet many questions about the “discovery” and its “discoverer” have yet to be resolved. Where and when did this so-called discovery take place? What were the circumstances that made it possible? Did it replace or simply supplement in-shore sailing as practiced long before in this particular region of the world? Not the least, why did it not occur before Roman times or even later? These questions all stem from a rather basic query, namely, the essential requirements—boundary conditions, one could say—for a successful open-water crossing of the Indian Ocean. As a corollary, historians have long debated whether Hippalos, the first individual credited in the 1st century CE with having made a direct crossing to India, was a real man or a legendary character, and assuming he was real, did he actually make the first crossing or simply publicized it. Indeed, Hippalos is a mystery figure to the extent that not even his profession is known (*PME* 57:19.2–7; Plin. *HN* 6.26.101).

The nature of the “discovery” has also raised controversy. A plethora of scholars has considered Hippalos as the one who discovered monsoon winds for the Westerners once they started taking an interest in the Indian trade (Warmington 1928: 9–47; Raschke 1978: 661; Albright 1982: 50; Desanges 1984: 158–159; Sidebotham 1986: 8; Casson 1989: 224; Nagaswamy 1995: 77; Krishnamurthy 1996: 10; Salles 1996: 252). Historians have also argued convincingly that the Greeks knew of the

monsoon phenomenon already in the early Ptolemaic period (Van Beek 1958: 147; 1960), perhaps even earlier (Das Gupta 1967: 5; Hitti 1968: 49; Hourani 1975: 28; Curtin 1984: 97; During-Caspers 1988: 24–25; Sidebotham 1986: 8, 46; Thapar 1990: 107). A pragmatic approach assumes that Hippalos did not actually discover the winds, but was the first sailor to make use of them for a direct crossing of the Indian Ocean (Hourani 1975: 26; Tchernia 1995: 995).

To begin with, the claim that someone “discovered” or “used” the monsoons is in itself ambiguous. Sailors on the high seas are apt to know a wind affecting sailing in a given time and place. A single or even repeated experience of one individual is hardly enough to conclude that this is an air current blowing frequently in a given area and always in the same direction (Plin. *HN* 2.46.119). Observations of this sort would have to be verified and the only way to do that would be to sail offshore and, risking one’s life, keep faith that the ship will not be stranded in windless waters for the rest of the sailor’s life (Petr. *Sat.* 102.11). Moreover, even if the Greeks “knew” about the monsoons, what is there to say that they recognized their usefulness for sailing in the Indian Ocean and understood how to purposefully take advantage of them to reach the faroff destinations.

It is therefore unwarranted to perceive the seasonal reversing monsoon wind in terms of “discovery” and “use”. It is more reasonable to ask when the Greeks began to rely on these air currents as a driving force and as an indicator of

direction for specific types of navigation. And pendant to that, when did sailors observe the wind to blow strongly across the entire Indian Ocean and when did they first apply this observation to attempt a successful crossing.

Ancient sources mention no one of the name of Hippalos and do not refer to his “discovery”, but they give an idea of the extent of nautical knowledge at the time and earlier on. Hippalos was not the first man (whatever his capacity) to

sail to India and the Greeks were not the first traders ever to sail the Indian Ocean. Under the Empire, the Romans tapped into the maritime trade with India that was progressing from at least the 2nd century BCE (De Romanis 1997: 94; Rajan 2002). Thence, the Westerners knew the Indian Ocean to some degree, but the extent of their understanding requires evaluation in order to be able to recognize what Hippalos actually knew and what he could have “discovered” [Fig. 1].

BACKGROUND

The first to attempt to circumnavigate—without success—the Arabian Peninsula was Hiero of Soli. The sailor launched the expedition at Alexander the Great’s command, but had to turn back when supplies ran out (Ar. *Anab.* 7.20.7–9; Ar. *Ind.* 43.7–8).

After 200 years without any achievements in this field, an Indian castaway was found by Ptolemaic guards on the Red Sea coast (Strab. 2.3.4–6). This survivor is supposed to have played a key role in the first successful maritime expedition to India launched by Eudoxos of Cyzicus



Fig. 1. The setting of Hippalos’ “discovery”: the expanse of the Indian Ocean to be crossed directly between Egypt and India (Source: <http://svsoggypaws.com/files/hidden.htm>)

around 118 BCE. One wonders, however, why after two centuries of sailing in the Red Sea the Greeks still had need of an Indian castaway to be able to reach India. Why had they not established a regular maritime trade route to the Indian sub-continent before this?

Looking at the issue from the other side of the Indian Ocean, the Indians, or the Tamils at least, had no knowledge (or perhaps need) to reach Egypt by a direct route. Pliny the Elder noted the ignorance of navigation demonstrated by the inhabitants of Sri Lanka (Plin. *HN* 6.24.83), even as the authors of the *Purananuru* anthology lauded the Westerners for being the first sailors to traverse the ocean. This does not mean of course that the Indians or Tamils did not participate in trade before or after Hippalos' crossing, but that the sailing was most probably dependent on coastal (in-shore) navigation. There is also no reason to believe that this commerce took the form of a regular and organized exchange on a scale similar to the Roman trade.¹ However, the fate of the Indian castaway mentioned by Strabo suggests that his presence in the Red Sea area was at the very least uncommon in that period or else that, in India, the possibility of reaching Egypt by a transoceanic maritime route was doubted (Strab. 2.3.4).

The issue was not in a presumed Arabian monopoly or the "secret" of the monsoon winds, but rather the length of the journey along the Arabian coast. It was a rocky, unknown and unfriendly coast-

line over a thousand nautical miles long (*PME* 26:65.31–32), with a limited number of places suitable for anchoring, collecting goods and restocking water supplies (Ar. *Anab.* 7.20.7–9; Ar. *Ind.* 43.7–8). The true distance to India remained uncertain and it was not clear how long the voyage would take, which overshadowed the question of supplies. Sailors had to prepare additional stores for windless days and unfavorable winds, but every additional barrel of water or food limited their potential profit from an exchange of goods. Neither was the durability of water reserves unlimited. Water onboard would become contaminated after some time with bacteria present in the air and water, and there was no possibility of restoring supplies on the dry, desert coast.

Then there was the issue of dependability. Not every voyage was successful. There are several accounts of sailors being blown off course for hundreds of kilometers during their voyage. The monsoon winds thwarted the plans of Annius Plocamus, a tax collector sailing along the Arabian coast who found himself somewhat unexpectedly in Sri Lanka (Plin. *HN* 6.24.84–85). Diogenes sailed from India to the Aromata promontorium (Ras Casey) but was pushed off course as far as Rhapta (Ptol. *Geog.* 1.9). The Indian castaway also fell victim of the wind, as did Eudoxos during his second voyage (Strab. 2.3.4). They survived to tell their stories when they came back to Egypt, but there were countless sailors who presumably died

1 Matthew Cobb (2018: 150–155) holds a contrary view. However, the dispersed archaeological finds, in space as well as time, and the enigmatic references in poetry, hardly argue in favor of a large-scale, long-term and regular exchange on the part of Indian and Tamil merchants. All they indicate is that such an exchange took place. Moreover, the Tamil poems attribute the open water crossing to India (*Purananuru* 66.1–2).

at sea from starvation and dehydration. Cases of castaways indicate that it was not enough to know where land was to be able to traverse the Indian Ocean. One had to

know one's position on the seas, the course to take across open water and the time of day, or year in this case, when winds would be blowing in the desired direction.

WHAT THE INDIAN CASTAWAY KNEW

The story of the shipwrecked Indian sailor from the end of the 2nd century BCE who offered to guide the Greek navigators to India is a good starting point for an investigation into the state of the geographical and navigational knowledge at the time.

Ever since Alexander opened India to the Greek, the long voyage sailing inshore around the Arabian Peninsula must have been considered by sailors a risk-heavy venture. Two centuries passed before something changed, namely, Eudoxus of Cyzicus made two journeys to India, in 118 and 116 BCE, guided on the first voyage by a shipwrecked Indian sailor. Strabo, who cites an earlier report, does not say whether Eudoxus made the passage by sailing along the coast or across the ocean, but the second option was always rather attributed to later generations of sailors (*PME* 57:18.30–19.2; *Purananuru* 126); in any case, a direct passage by Eudoxus would be in contradiction to Hippalos' alleged "discovery" perhaps a century later (*PME* 57:19.2–3; Pliny *HN* 6.26.101).

During his second expedition, Eudoxus was pushed far down the African coast by the blowing monsoon (Strab. 2.3.4). He was aware of the seasonal winds and used them but to no avail. Thus, he was the first Greek, not Hippalos, to make conscious use of this wind system. Nonetheless, awareness of the monsoonal wind system and the advan-

tages it offered to sailing in the Indian Ocean (for at least a century before the alleged first transoceanic crossing) was hardly enough to knowingly circumnavigate the vast ocean.

The Indian sailor, shipwrecked in the Red Sea by accident and perhaps on his first crossing, was still capable of offering guidance on the journey to India. He was certainly going home and thus could relate his Red Sea location to his point of departure, even if he may have felt lost in this new land. However, assuming that he was somehow the first Indian sailor to reach Egypt by the maritime route, his knowledge would still post-date his accident and not be available to either the Greek or the Indians before that. He could have recognized the wind as being the same one that he knew from the Indian coast and which had left him stranded in the Red Sea. Indeed, he could have actually experienced it all through his unfortunate voyage from east to west across the Western Indian Ocean and, by dint of sailing for many days, he would have had the opportunity to check how long it lasted, whether for just a few days or longer. He could have also had the opportunity to check its direction and observe whether they were steady or changed over time. All things considered, however, it does not explain how this unnamed Indian sailor knew how and when to sail home.

The Indian would have shared with Eudoxos not only his knowledge of how to take advantage of the monsoon wind system, but also how to navigate in the Indian Ocean and along the Arabian coast. During the day it was enough to sail within eyesight of the shore to be guided by it. There was no need to determine the position of a ship regarding the destination, which would be sighted in due course along the coast. Sailing was relatively easy as long as it was within sight of the coast, which under right conditions can be up to 92 km from the shore. Furthermore, well-located landmarks allowed for an average distance of as much as 35–40 km from the shore (Piskozub 1976: 56). This was important in the case of the southern Arabian coast, which is rocky and dangerous. Sailing at some distance from the shore made it possible to use the monsoon winds to achieve full speed without risk of the ship being pushed onto the rocks (Ducin 1997: 21), which was of particular importance for deep-draft units, which could easily run aground on the seaboard side.

The most likely scenario for Eudoxos' exploratory voyage is that he followed the coastline. On his second voyage he probably ventured further out to sea and suffered from unfavorable winds which pushed his ship off course (Strab. 2.3.4). A navigator with experience in coastal sailing will know the topography of the coast and the landmarks will let him take a course across bays heading all the time for the intended destination. Small bays are in this case not that much of a problem because there is little margin for error in maintaining the right direction and the risk is small compared to the time saved by shortening the distance covered

by the ship. If the coast was obscured for whatever reason, the direction could be deduced from the position of the sun at sunrise and sunset. It meant, however, that accurate observations could be made only twice a day and in any case, the measurement was not very precise because of the height of the sun. Moreover, the position of the sun depended on the season and the ship's latitude. Nevertheless, the daystar allowed the direction to be maintained during the day with only a small margin for error (Ducin 1997: 180).

Cutting across bays in coastal sailing (*PME* 57:18.30–19.1–2) was essential for a better profit which came from more time for trading. That time was indeed an issue is demonstrated by Pliny the Elder's comment on India being "even closer" after Hippalos (Plin. *HN* 6.26.101). However, to cross the open ocean required more extensive cartographic knowledge than that offered by coastal navigation (Tchernia 1995: 997–998; Bukharin 2012: 216). It was important to know one's position, the estimated distance between two points en route and their relative location. This, in turn, required knowledge of the latitudinal position of India to avoid missing the subcontinent entirely on the south. The longitudinal position was also required because it served to estimate the approximate distance.

Bukharin (2012: 218–219) suggests that what Hippalos actually accomplished was to chart the Indian coastline based on inshore navigation, and this came in handy once the Greeks started to traverse the open ocean in larger ships. Even if such a chart ever existed, it still would not have allowed the ship's position to be established and,

thus, it would not provide guide sailors to given destinations. Besides, there is no reason to assume that a chart with the correct position of cities, at the right distance from one another, with the right proportions and direction, could be drawn based solely on coastal navigation (Arnaud 2014: 39–68). The Greeks drew up maps of India as early as in the times of Alexander the Great

and still it took them two centuries to make the first voyage to the subcontinent (Strab. 2.1.4). Moreover, Strabo indicated twice that the Horn of Africa and India are on the same latitude and his knowledge probably came from the Hellenistic geographers (Strab. 2.1.14, 2.5.14). This information, however, provides neither direction nor position on the open waters.

ASTRONAVIGATION

Considering the possibility of a trans-oceanic passage, Hippalos had to know at least three things: the pattern of the monsoon winds, the length of the route, and how to travel across the ocean and not get lost. The expedition of Eudoxos had supplied information on the monsoon and the distance was known thanks to the decades-long process of shortening the in-shore sailing route as much as possible. Ships had become bigger by this time and the supply logistics for given ventures had been settled in a slow process of balancing safety with profitability. It remained for the Greeks to learn how to determine the ship's course in open waters. This they did over the course of years of continuous trading with the Indian subcontinent, learning how to shorten the passage along the coastline and retaining a detailed knowledge of coastal topography in the process.

Navigation took place probably at night when ship navigators could be guided by the stars assuming the sky was clear. In cloudy weather or mist, or if moonlight was too bright, they had to steer by experience and all the merchant was left with was faith that the helmsman

would manage to hit the coast close to the actual destination. Even more precision was needed when heading for an island (*PME* 31.10.20–22). Sailing at night is safe only when traversing known waters and far from a treacherous rocky shore. The problem is even greater in narrow reservoirs like the Red Sea (Casson 1989: 285).

Measuring the distance between celestial bodies and the horizon with a Jacob's staff made it possible to approximate a ship's latitudinal location (Ducin 1997: 36). The best celestial bodies for this purpose are the ones that do not move and present a position congenial to the principal directions. However, in the long run, every star changes its position due to the Earth's precession (Davis 2009: 136–138). For instance, in Roman times the North Star did not point to true North, but a near-to-it direction. For this reason stars are a good guide but only for a few centuries.

Navigation by night, however, was not common knowledge. It required a perceptive steersman and suitable conditions (Petr. *Sat.* 102.3). The skill was also expected of military men needing to know their position on land (Strab.

1.1.21; Plin. *HN* 2.75.185). In the Mediterranean Sea, this type of sailing has been confirmed since the time of Homer at the very least (Hom. *Od.* 5.270–275; Arnaud 2011: 62), but in the Indian Ocean it is uncertain when indigenous populations achieved it. The story of Eudoxos indicates, however, that neither the Greeks nor the Arabs or Indians practiced nocturnal sailing across open waters before the end of the 2nd century BCE.

Having found himself in the Red Sea area, the Indian castaway would have had the opportunity to observe the constellations he had already seen in the space of his voyage. This made him certain of his position and gave him the knowledge of which stars were visible while sailing from

India to the Bab el-Mandeb. Having the heavens as a guide, Eudoxos could sail full speed day and night away from the shore and, more importantly, away from potential wrecking on a rocky shore or getting lost in unknown waters. Nonetheless, knowledge of astronavigation was still uncommon in the Indian Ocean at the turn of the eras as attested by Pandyan's embassy to Augustus (Flor. 2.34). The embassy travelled for several years before reaching the Roman Empire, meaning that it traversed the vast distance from Limyrike (roughly corresponding to the Malabar coast of India) to the Mediterranean by land. In this case, however, the choice of a land route could have been dictated by the elephants that the embassy brought as a gift for Augustus.

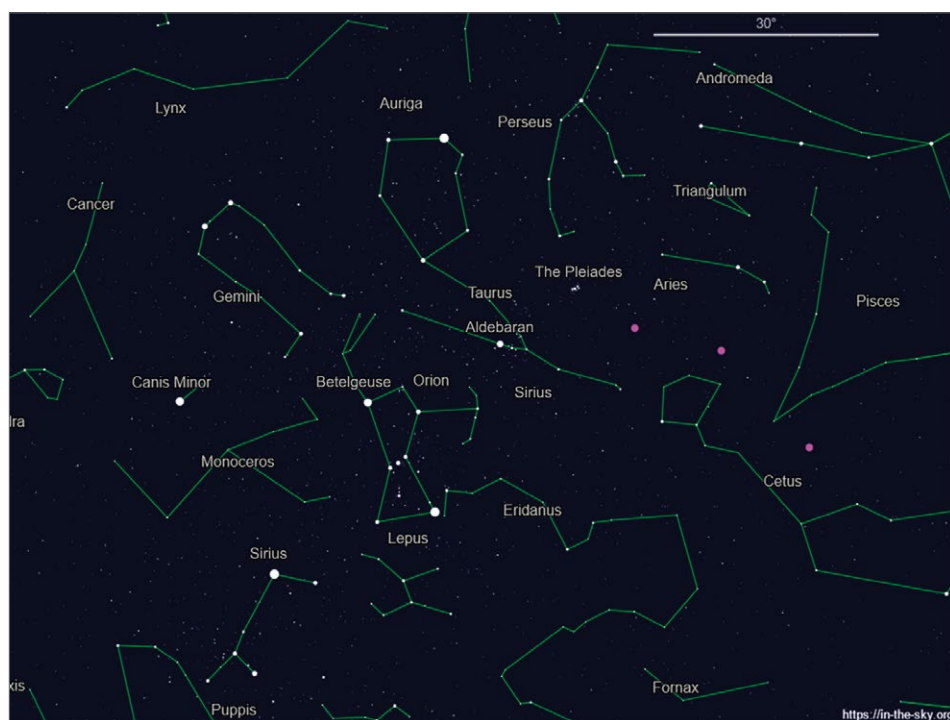


Fig. 2. The night sky in the west seen from Sanaa, Yemen: Orion Belt, Betelgeuse, Aldebaran, Sirius, and the Pleiades (Source: <https://in-the-sky.org/data/object.php?id=TYC1266-1416-1>)

Westerners sailing in the Indian Ocean had many stars they could use for navigation. The Orion Belt, Betelgeuse, Aldebaran, Sirius, and the Pleiades [Fig. 2] shine in the eastern part of the heavens, while Polaris points north. These stars begin to appear in early August, which is compatible with the *Periplus* and Pliny's suggestions to set about a trip to India in July, before the rising of Sirius (*PME* 39:13.12–13, 49:16.31–32, 56:18.28–29; Plin. *HN* 6.26.104). After a month of travel across the Red Sea (Casson 1989: 285), sailors had the exquisite Pleiades, Aldebaran and Betelgeuse marking the west, however, only for a short time of the night at the end of the January. The times when these stars appear are given in the *Periplus* as the suggested moment for setting out from India (*PME* 49:16.32, 56:18.29; Plin. *HN* 6.26.104). If it was too late in the season, sailors would have problems not only with the monsoon wind but also with a lack of such guiding stars. It could have been an additional reason for sailors to stay on in Moscha Limen, if the time was too late to set sail (*PME* 32:11.1–5).

There are many accounts of the stars used in the Indian Ocean by the Greeks. Pliny the Elder notes that Ursa Major and Ursa Minor (Septentriones) were not visible in the latitude of Troglodytice and Egypt, in Arabia it was seen in November, and in Meroë only for a short time, a few days before the rising of Arcturus. He also says that some of the southern stars were not visible in the north: one could not see the star of Canopus (α Car, the brightest star in the constellation of

Carina and the second brightest star of the northern sky) or Coma Berenices (α Com, β Com, γ Com) in Italy (Plin. *HN* 2.71.178). The Septentriones were not visible in the latitude of Sri Lanka and neither were the Pleiades (Plin. *HN* 6.24.83, 87). According to Pliny, the voyage to India should take place before the rising of Canis Majoris (Plin. *HN* 6.26.104). Duris of Samos² claimed that those traveling to Limyrike could see Taurus in the midst of the heavens and the Pleiades above the middle of the yardarm. And those who sailed from Arabia to Azania should follow Canopus as the southernmost star (Ptol. *Geog.* 1.7.6). According to Diodorus of Sicily, the Ursa Major was not seen in Southern India at all, and in Arabia Felix only for a part of the night between November and December. At the edge of the subcontinent, Arcturus was not to be seen (Diod. Sic. 2.35.2, 3.48.1).

Upon reaching a given trade port or crucial landmarks navigators could remember or write-up the arrangement of the stars and conclude which city was farther north or south. Having experience, they could calculate the change of course needed to reach their destination (Luc. *De Bello* 8.159–201; *PME* 57:19.7–12; Ptol. *Geog.* 1.7.6). Navigators also had to have a mental map of the area (Arnaud 2007: 327). It does not mean, however, that traditional charts would be drawn up on the basis of this knowledge. Sailors' awareness of the position of individual cities was only approximate and it required a geographical apparatus and specific astronomical phenomena to prepare a proper itinerary.

2 His works have not been preserved and his years of life are unknown. One of the islands in the Red Sea may have been named in his honor. If so, then he would have lived before the author of the *Periplus* (*PME* 4:2.2–3).

After several decades of sailing to India the Westerners were equipped with all the information they needed to make a successful traverse of the Indian Ocean. They knew the overall configuration of the northwestern Indian Ocean (Strab. 2.1.14, 2.5.14), they had started using larger ships and they had learned how to sail around the Arabian coast as far as India (*PME* 57:18.30–19.2). They had also gathered knowledge of the stars' rising times, position in the sky and immobility (Plin. *HN* 2.71.178, 6.24.83, 6.26.104). Importantly, they had an economic reason to make India "closer" and the risk of such travel was not as high as in previous decades. At some point, a Greek sailor like Hippalos combined all the information, calculated the risk and the profits from such travel, and decided to attempt the first direct voyage to India. This, however, was hardly a "discovery" but a bright idea to make the fullest possible cut of the angle across the Northwest Indian Ocean based on "the location of the ports of trade and the configuration of the sea" (*PME* 57:19.2–3).

The fact that the name of Hippalos endured over the centuries does not mean that he was the first sailor to make a transoceanic journey. Many others may have undertaken such trips before him, but either they were unable to repeat the feat or had not shared their knowledge with other sailors, or simply lost their lives along the way. Pliny also calls the wind

itself "Hippalos" (Plin. *HN* 6.26.100) and Ptolemy (Ptol. *Geog.* 4.7) links the term to the sea. In Tchernia's opinion, there was never a sailor named Hippalos. He argues that the whole issue is the result of a mistake made in translation. The editor working on Pliny the Elder's text added an extra letter "p" to the Greek word "hyphalos" meaning "wind", thus creating a sailor of the name Hippalos, who was then wrongly identified as the one who discovered a new form of navigation (Tchernia 2011: 289–294).

Should the theory about the error in the editing of Pliny's text be proved true and there was no Hippalos, then he obviously could not have been the first to "discover" a direct route to India. Pliny after all does not actually claim that a sailor of this name discovered a new way of navigating, but uses the name for a southwest wind. And yet the author of the *Periplus* claims that the discovery was made by a ship captain called Hippalos, and so the error was not made in his guide. Regardless of whether Hippalos existed or not, there had to be sailors who were the first to cross the open waters of the Indian Ocean to India and it may be concluded that the change was the result of more than a century of sailing experience rather than an enlightened "discovery" by an exceptional sailor. If Hippalos existed, he would be a man created by history (or historians) but not one who made history.

VESSEL SIZE

The issue of vessel size on that "first voyage" seems to be exaggerated (Casson 1989: 35; Young 2001: 27; Bukharin 2012:

218–219; Cobb 2018: 84). According to the *Periplus*, large ships were the effect rather than the reason for the change in naviga-

tion style (*PME* 57:19.1–2). Small size and low immersion of vessels made it easier to sail upriver once in India and cross dangerous waters as in the case of Barygaza (*PME* 43:14.21–44:15.12). They were less dependent on port infrastructure, which allowed them to barter with more places and do it faster. However, small ships rarely had enough capacity to carry both supplies and cargo on a long-distance voyage along the inhospitable shores of the Arabian Peninsula or across the Indian Ocean (Strab. 17.1.13; *PME* 47:19.2–4). Rationing space set apart for water and provisions entailed substantial risks in case of being blown off course, whereas limiting cargo volume was economically unfeasible. Thence, it is unlikely that the first expedition embarked on a small ship,

especially if the Ptolemies equipped the mission with luxury goods (Strab. 2.3.4). The Indian coast was not much better than the Arabian one in terms of safe passage (Plin. *HN* 6.24.82; *PME* 40:13.15–32, 43:14.21–16.2) and suitable for sailing only a few months per year. Thence, the ship had to be prepared for various hazards.

Increased vessel size was suitable for transoceanic travel because of more resistant hulls and better cargo-capacity (Young 2001: 27). The risk could be compensated by privileges and favorable commercial offers or reduced by government action (*PME* 43:14.21–46:16.2, 49:16.23–25) but it could also be determined by the port in India that attracted the Greeks' attention (Petr. *Sat.* 101.9; Plin. *HN* 6.26.104–105). If this harbor



Fig. 3. Examples of coastlines at the opposite ends of the voyage: top left, desert beach at Berenike on the Egyptian Red Sea coast; bottom right, modern view of the location of the port of Muziris in India (Sources: top left, courtesy I. Zych; bottom right, <https://www.keralatourism.org/muziris/muziris-project>)

was located upriver from the coast, merchants would have to use smaller ships to transport their goods [Fig. 3 bottom right], leaving the main vessels at anchor vulnerable to tides and storms. As a matter of fact, most of the ports on the Indian Ocean were unsuitable for large crafts (PME 3:1.17–18, 7:3.15–16, 10:4.7–8, 12:4.22–26, 43:14.21–15.3, 45:15.13–20, 54:18.1–5; *Purananuru* 343.6–7).

To risk one's investment in a big vessel and with a large cargo of trade goods, one needed to be assured of knowledge and experience that would ensure reaching the destination. With every successful voyage to India and back, the store of what the Greeks knew was increased, making it more reasonable to spend more money on better cargo-capacity. Coastal trade was very time-consuming and made the trip to Limyrike difficult and unprofitable. The farther merchants wanted to sail, the more they risked having to spend an additional season in India or on the back voyage (Plin. *HN* 6.26.106; PME 32:10.30–11.5). The advantages of the big vessels, that is, improved capacity and resistant ship construction, became remunerative only after Hippalos had “made India even nearer” to the Greeks (Plin. *HN* 6.26) but not before.

The author of the *Periplus* says the first exchanges took place using “smaller” vessels that sailed inshore (PME 57:18.30–19.2; Plin. *HN* 6.26). But this was already in the times after the alleged discovery of Hippalos and it is not clear whether these were smaller craft compared to what was used in the author's time, or just small in general. The second option seems unlikely, small vessels being at a disadvantage in the trade with India as already explained.

The Tamil poem *Purananuru* identified the Roman ships as large and superb (*Purananuru* 56.18–21; 126.14–17), but it refers to a region where commerce was in full swing and on an enormous scale (PME 56:18.16–17; *P. Vindob.* G 40822). The exchange with Limyrike required large ships, but trade on a huge scale can be proved only for the post-“discovery” time. A separate issue with regard to the Tamil poem content is whether the ships thus described were large indeed or only seemed so compared to local counterparts (Fauconnier 2012: 87).

In all likelihood, small and middle-sized vessels were used for the first commercial contacts with India, their cargo capacity sufficient to maintain a good-enough cost-effectiveness ratio. The first voyages were also fraught with a considerable amount of uncertainty: the Greeks could not be sure about the offer of goods, the prices and the administrative or political situation in the eastern ports. Moreover, the status of Egyptian Greeks probably changed after Augustus' conquest of Egypt and the trade would have come under new regulations (Flor. 2.34; Plin. *HN* 6.24; Strab. 15.1.4; *Res Gestae* 5.31; Sidebotham 2011: 192; Speidel 2015: 112–113). Accumulated experience in managing these commercial activities would have led to the growth of both trade volume and vessel size—to the limits of the Indian harbor facilities (PME 38:12.21–13.4, 43:14.21–15.3; Plin. *HN* 6.26.104; *Purananuru* 343.6–7; see Arnaud 2011: 63). Adding sails, which translated into higher sailing speed, would have also helped to increase trade profits, but they were not essential for Hippalos' transoceanic run. The Westerners—as did Hippalos—oper-

ated ships of moderate size in their time, but bigger than those used by Eudoxos and his contemporaries. Vessels of huge size were adopted when Southern India was made “closer” and it became possible to purchase an enormous amount of pepper and *malabathron*/*malabathrum* (cinammon-like plant) on the return trip (*PME* 57:9.1–2).

Even after Hippalos’ purported discovery, Westerners continued to use different types of crafts. The author of the *Periplus* informs that water tides on the Narmada river (the longest west-flowing river of India which drains

through the Gulf of Khambhat into the Arabian Sea) can be so strong that they can push vessels away, possibly breaking up large ships or capsizing smaller units (*PME* 46:15,21–28). This one fragment of the navigational guide proves that the Greeks were able to reach Arabia Felix and northern India in small vessels, and they used to do it even after Hippalos’ venture. Whether they were used also for commerce with Limyrike remains uncertain. Moreover, the actual size of these ships and that of their smaller counterparts employed in trade with Barygaza, is still unknown.

CHRONOLOGY

The date of this advancement in sailing is uncertain. The time span between the two voyages of Eudoxos in 118 and 116 BCE and the *Periplus*, which is commonly attributed to the mid or second half of the 1st century CE is rather broad but can be narrowed down to some extent. Prior to the Roman conquest of Egypt, the Greeks crossed the Bab el-Mandeb reluctantly and not many ships made the long voyage to India and back (*PME* 26:8.26–31; Strab. 16.4.4, 17.1.13). In the rule of Augustus, the Westerners’ trade with India and beyond picked up substantially (Strab. 17.1.13). Thence, Strabo could say that the much greater knowledge of Arabia Felix in his time was due not only to the ill-fated expedition of Aelius Gallus to Arabia in 25 BCE, but also to a trove of anonymous merchants (Strab. 2.5.12). Despite being well-informed, Strabo fails to discuss a direct crossing to India, either from Arabia or from the Horn of Africa. According to Pliny, the Numidian king Juba II

had no knowledge of a direct route to India (Plin. *HN* 6.26.96). Since Juba died in 23 CE, not quite a year before Strabo’s own demise, Hippalos’ historic voyage could not have taken place significantly before the year of the king’s death which Strabo mentions in his work (Strab. 17.3.7). At the other end of the timeframe, the upper limit for that first transoceanic crossing to India can be teased out based on information given in the *Periplus*. Accordingly, it is said in the *Periplus* that Arabia Eudaemon was a famous and prosperous port “in earlier days” and had been ransacked “not long before our time” (*PME* 26:8.26–31). Strabo’s reference to the increased number of ships making the voyage to India and Ethiopia, assuming the Roman historian had correct data, would refer to the volume of trade before the conquest of Egypt or not so long after it (Strab. 17.1.13). However, the observation from the *Periplus* is somewhat more ambiguous.

The burning of Arabia Eudaemon has been dated variously, to the reign of either Augustus (Warmington 1928: 15; Lamotte 1953: 101; Miller 1969: 15), or Claudius (Leider 1934: 54; Hourani 1951: 31), or Nero (Altheim and Stiehl 1961: 247). Since the expedition of Aelius Gallus in the time of Augustus took place in 25 BCE, it cannot be considered as the reason for the destruction as suggested by some scholars (Wellesley 1954; Ryckmans 1957: 81; Schwartz 1960: 24; Raschke 1978: 647, 872–873). The only known Roman ruler to gain fame in the area was Gaius Iulius Caesar Vipsanianus, adopted son of Augustus, who was born in 20 BCE and died in 4 CE (Strab. 16.4.22–24; *Res Gestae* 5.26; Plin. *HN* 6.32.160; Cass. Dio 53.29.3–8), and no other Roman army ever reached Arabia Felix after Aelius Gallus (Strab. 16.4.23–24). Another potential but unproven perpetrator of the burning of Arabia Eudaemon is the South Arabian king Charibaël (Schoff 1912: 115–116).

The phrase “now long before our time”, which appears in this context in the *Periplus*, should be understood as after the death of Strabo, who does not inform about the event, but before the writing of the navigation guide, dated by most scholars around the middle of the 1st century CE. Furthermore, the author of the *Periplus* knows Charibaël as “the friend of emperors” (*PME* 23:7.27–29), which has been interpreted as a reference to the king’s good relations with at least two Roman rulers: Tiberius (14–37 CE) and Claudius (41–54 CE), Caligula being a less likely possibility because he reigned for a relatively short time (37–41 CE). Indeed, Claudius was possibly still alive when the navigation guide was first written down,

so the term “before our times” cannot refer to his rule and the date should be moved down to either Tiberius or Augustus. If it had indeed happened in his rule, Augustus would have undoubtedly boasted of this achievement. According to the ship captain who authored the *Periplus*, ships used to sail for India from Cana (South Arabic Qana, modern Biʾr Ali in Hadramaut) and Arabia Eudaemon (modern Aden) in the kingdoms of Himyar and Saba, which should be taken to mean that Hippalos could not have departed on his voyage after the burning of the latter city (*PME* 57:18.30–19.2). His venture could not have taken place as late as the reign of Claudius because that was the time of the first successful contact with the island of Sri Lanka, when a ship sent out by the tax collector P. Annius Plocamus, sailing along the Arabian coast, was driven way off course by the northern monsoon wind. The voyage was clearly transoceanic, but no one among the ancient commentators goes as far as to call Plocamus the “discoverer” and the description of Sri Lanka in the *Periplus* is much less extensive (*PME* 61:20.14–19).

If the burning of Arabia Eudaemon occurred during the reign of Tiberius, then the Hippalos venture must have taken place after this event but before the emperor’s death. The dynamics of the trade with the East is reflected in Tiberius’ speech to the Senate during the consulate of Gaius Sulpicius Galba and Decimus Haterius Agrippa in 22 CE (Tac. *Ann.* 3.52–53). The Emperor is criticizing the outflow of the Empire’s wealth to the state’s enemies in exchange for luxuries, complaining about the corruption in Rome. However, it would

take years between the “discovery”, the growth of trade and the Court taking notice of this successful operation. The issue Tiberius is arguing cannot be the “discovery” itself but some other kind of change. Even if this statement is too ambiguous to be interpreted as direct proof, it may provide a context for the political situation in Arabia Felix. On one hand, the emperor condemned the transfer of Roman wealth to alien and enemy states and, on the other hand, the author of the *Periplus* calls Charibaël “the legitimate king” of the Sabaeans and Himyarites (*PME* 23:7.28). Assuming these statements touch upon the same issue, there could have been more than one candidate to the throne of the South Arabian kingdom, the Roman Empire weighed in on the side of one of these candidates and a civil war could have led to the unification of the region under the rule of Charibaël (*PME* 23:7.27–29; Casson 1989: 149–151; Robin 1998: 264; Retsö 2003: 539; Nebes 2009: 53; Potts 2010: 37). Nevertheless, the aid given by the Romans is not specified anywhere. The background of Roman intervention or support was economic rather than political. However, according to some scholars, there is no literary, archaeological or other evidence which can prove the involvement of the Roman Empire in economic matters apart from building infrastructure or collecting taxes (Young 2001: 213; Whitewright 2008: 56).

Charibaël moved the center of the unified kingdom from the destroyed harbor of Arabia Eudaemon to Muza in the Red Sea basin, which did not have hardly as good a position for trading with India and Ethiopia; it was not even a water sta-

tion (*PME* 26:8.24–26; Plin. *HN* 6.26.104). There is no reasonable explanation for why the Himyarites would have left a good port location in this way unless under military or political pressure. Roman involvement in Arabian affairs is reinforced by a series of coins minted from the 1st century BCE to the mid-1st century CE, presenting the Athenian owl on the obverse and the bust of a Julio-Claudian emperor on the reverse. The coins with a bust of Augustus are recognized as Sabaeans (Munro-Hay 2003: 47–48) or Himyarite (Potts 1994: 214; Huth 2010: 100). According to Speidel (2015: 107), the only reasonable explanation for such a policy was the desire to please the sovereign or to show loyalty.

The author of the *Periplus* may provide us with a second timeframe. He speaks of the port of Arabia Eudaemon having been destroyed shortly “before our times” (*PME* 26:8.31–32) and that in the past ships had not dared to sail beyond this port. The author of the navigation guide appears to be referring to three separate stages: the first when ships stopped at Arabia Eudaimon, the second when trade followed the coastline, and the third when open-sea sailing became possible. The destruction of Arabia Eudaimon occurred in the meantime, the term “our times” referring presumably to the reign of the emperor, assuming that the navigation guide was produced not as a typical *periplus*, but as a guide for a wealthy merchant. This vague referral would have been clear for the intended reader. The destruction of the city occurred probably during the reign of a ruler other than Claudius (41–54 CE), perhaps Caligula (37–41 CE), consider-

ing that king Charibaël is described as friends with more than one emperor. However, since Caligula ruled briefly, Tiberius (14–37 CE) can also be considered a good possibility.

The timeframe of the Hippalos venture can thus be narrowed down reasonably to the years 23–37 CE. Casson (1989: 7) dates the writing of the *Periplus* to be-

tween 40 and 70 CE, which McLaughlin (2014: 111) convincingly narrows it down to 51–56 CE. Both historians, however, fail to take into account that the time expressed in the *Periplus* does not have to be tantamount to when it was written down, or even that fragments of the navigational guide referring to different regions could reflect knowledge from other times.

CONCLUSIONS

A reconstruction of Hippalos' so-called discovery requires knowledge of navigation in the Indian Ocean and how it changed over time. Best known are the two expeditions of Eudoxos and Hippalos but many questions still remain.

An Indian shipwrecked sailor, who found himself accidentally in the Red Sea region, finally helped the Greeks to navigate around the vast coast of Arabia Felix (Strab. 2.3.4). After decades of semi-coastal sailing to India and the eastern African coast, commerce had been concentrated in a transit port, probably Arabia Eudaemon (PME 26:8.26–32; Tchernia 2011: 289–314; McLaughlin 2014: 77). This was due to the risk in coastal trade with India, a limited demand for luxuries from the East and a strict economic policy on the part of the Ptolemies (Strab. 2.3.4).

The Roman conquest of Egypt changed the economic situation in the Indian Ocean. Having access to the Roman market, more and more merchants decided to trade with India (and east Africa) directly, but their ships most likely still sailed inshore along the southern Arabian coast (PME 57:18.30–19.2; Strab. 17.1.13). When political unrest in southwestern Arabia Felix resulted at

some point in the destruction of Arabia Eudaemon and Muza becoming the main port of the united kingdom of the Sabaeans and Himyarites (PME 23:7.27–30, 28:8.31–32), the situation on the seas became crucial. Meanwhile the Westerners had continued shortening the coastal route by traversing bays and finding a way straight across from Syagrus, a promontory in the middle of the South Arabian coast and the eastern border of Al-Qamar Bay (today Ras Fartak) to Patalênê (island of Patala at the mouth of the Indus River, today in Pakistan) (Plin. HN 6.26.100, 32.153). Then they shortened the way even more by sailing straight for Sigerus, a port in the Konkan region on the western coast of India (Plin. HN 6.26.100–101). And then, looking for a still greater profit, a sailor named Hippalos took the biggest ever shortcut to India by sailing straight across the northwestern Indian Ocean (PME 57:19.2–7). It is not clear whether he started out from Southern Arabia or eastern Africa and whether his destination was intended as northern India or Limyrike. Nonetheless, his bold venture made such voyages possible and as such he was remembered (PME 57:19.7–12).

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