FROM THE SCAMANDER TO SYRACUSE. STUDIES IN ANCIENT LOGISTICS

by

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DECLARATION

I declare that “From the Scamander to Syracuse: Studies in Ancient Logistics” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SUMMARY.

This dissertation discusses logistical aspects of the Persians invasion of Greece; the Athenian need for timber for building warships; supply problems in their assault on Syracuse; and the march of Alexander's army from Macedonia into Asia.

The amount of cereals needed by the Persian and Greek armies and navies is calculated from modern nutritional data and an estimate of the numbers of combatants. The location and size of the Persian food dumps; the excavation of the Athos canal; and the ships and materials needed to build the bridges of boats are considered.

The Athenian need for ship-timber led to the costly occupation of Amphipolis. An assured supply of cereals was one motive for the disastrous Sicilian Expedition. The Athenian fleet was an inefficient long-range support for an army which had to protect its non-combatant sailors. This was realised by Alexander the Great, who crossed the Hellespont without naval support.

KEY TERMS
Size of Persian army; Athos canal; The trireme; Bridge of boats; Amphipolis; Food dumps; Leuke Akte; Daily requirements of cereals; Water needs of trireme crews; Firewood and kindling; Shipping of cereals; Supply train.

CONTENTS

MAPS, DRAWINGS and PICTURES

Unless otherwise stated, the maps are original, derived from outlines drawn from maps downloaded from MS World software.

INTRODUCTION

Logistics

The word "logistics" can be generally defined as "The planning and carrying out of any complex or large scale civil or military operation". It is a word that had little currency before World War II, before which it meant "strategy" or "philosophy of war" or an archaic branch of knowledge related to mathematics.[1] This dissertation was prompted by the study of General Sir Frederick Maurice's seventy-five-year-old paper on Xerxes' crossing of the Hellespont in 480 BC.[2] His concern was to estimate the size of the Persian army, not to discuss the logistics which supported it. Although it is very much out of date, his paper is perhaps the seminal work which has prompted later work on ancient military logistics.

It has been pointed out that studies of ancient military campaigns generally assume that armies "lived off the land" and these comfortable assumptions relieved the authors of any necessity to consider how an army (or navy for that matter) was kept operative in the field or at sea.[3] Such assumptions lead to distorted views of war. This being so, it must be borne in mind that the ancient authors addressed a limited audience of educated contemporaries, a considerable proportion of whom had both executive and combat experience of war, and so naturally assumed that their readers understood without amplification what they were saying and, as a result, took a great deal for granted. Consequently, modern readers are obliged to rely on conjecture and fill the gaps with probably incorrect conclusions. It is only in recent times that the logistics of ancient warfare have been studied as a discipline, and, with the exception of the corn supply to Athens and Rome, what might be termed ancient "civil logistics", have received little attention. This dissertation discusses examples of ancient logistical problems of a military nature in Greek history. Chapter One discusses logistical problems which had to be solved by the Persians before and

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[1] Leighton,R. *Encyclopaedia Britannica,* London 1964,14. 325.
[2] Maurice F. *The Size of the Army of Xerxes in the Invasion of Greece 480 BC.* Journal of Hellenic Studies. 50,(2).1930, 210-235.
[3] Roth J. *The Logistics of the Roman Army in the Jewish War.* Doctoral Thesis. Ohio.1991.

during their invasion of Greece in 480 BC. Chapter Two reviews the two unsuccessful Athenian colonisations of Amphipolis, an area rich in timber which was needed to maintain their huge fleet, which had to protect the supply routes of the grain ships. The ever-present threat of famine was taken for granted and the need for an assured supply of grain only tangentially mentioned by Thucydides. In the absence of inscriptional or little other documentary information, the consequences are largely speculative. Chapter Three discusses how growing Athenian long-range aggression culminated in the Sicilian Expedition which is followed as far as the point where planned support for the invading army ceased and Nicias retreated from Syracuse, his army carrying its food and water.

Chapter Four is a short description of Alexander's crossing of the Hellespont with manageable and well supplied forces, in the prelude to the careful logistics of his victorious Asian campaign, which is outside the scope of this study.

The references to book, chapter and paragraph in Herodotus, Thucydides and Xenophon are taken from the Loeb translations of the works, but the modern English of the Penguin editions is preferred for most quotations. Numbers of four or more figures, and units of length and mass, are written in full as arithmetic and metric conventions differ.

Early application of logistics.

The Assyrians are credited with being the first state able to support a standing army, unlike their hostile neighbours who called up their citizen farmer-soldiers for campaigns which were fought during the interval between crops being sown and harvested. The Assyrian army was available at any time of the year and probably numbered about fifty thousand men.[4] It included an effective supply organisation for desert and mountain warfare known as the *musarkisus* which, amongst other tasks, obtained, bred and trained, three thousand horses a month to supply the cavalry,

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[4] Thompson J.T. *The Lifeblood of War,* Brassey 11; and also Gabriel R.A. & Metz K. S. *From Sumer to Rome, the Military Capabilities of Ancient Armies*. Greenwood. N.Y. 1991.

and additionally supplied the necessary fodder as well.[5] It also had to supply and feed the oxen needed to move the equipment for siege-trains which had been developed to counter the increasingly sophisticated fortifications of the cities which defied their investing armies.[6]

Water and large armies.

Despite his logistical expertise and overwhelming military superiority the Assyrian king Sennacherib was foiled in his attempt to capture Jerusalem in 701 BC. The Judean king Hezekiah (715-687 BC) had excavated a tunnel from a spring outside the city walls to a pool within them.[7] By blocking up the spring outside the walls he denied the Assyrian army water and ensured its retreat. This early example emphasises the prime importance of the availability of water, even before food supplies are considered. This essential factor in military planning will be discussed in more detail in the crossing of the Hellespont by the Persian army in 480 BC.

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[5] Gabriel & Metz : 1991, 3.
[6] New English Bible. *2 Chronicles*. 32.
[7] Scheffler, E. *Fascinating Discoveries from the Biblical World,* Biblia. Pretoria. 2000. 19.

CHAPTER ONE.

CROSSING THE HELLESPONT: Unexpected defeat.

The Persian Achaemenid kings lost no opportunity to proclaim their self-adulation in inscriptions such as Darius' trilingual one at Behistun and those on the palace walls of Susa and Persepolis. His son Xerxes followed suit, but rather naturally did not leave a memorial of his repulse from Greece in 480 BC. Herodotus reports that the king's secretaries took down notes of all that he needed to know, but none of these records survive.[8] The only account of Xerxes' invasion from the Persian side comes from the late fifth century Greek, Ktesias of Cnidos who was physician to Artaxerxes II. His unreliability makes Herodotus seem a model of accuracy.[9]

The sources

Writing about the events 50 years later, Herodotus has left us a vivid picture of Xerxes' invasion, explaining the reasons for it in a long preamble of five books. He painstakingly recorded the recollections of surviving combatants. Although his account is a major part of his "*Histories*", occupying the last three of its nine books, it is not detailed enough to satisfy the curiosity of modern readers, who are frustrated by gaps and questionable assertions. Nevertheless his record is an intriguing picture of a military adventure of a size and boldness not seen again anywhere until Napoleon's campaigns twenty two centuries later.

Some five centuries after Herodotus, Plutarch gave some insights into the Greek defence through his *"Life"* of Themistocles, which one commentator says had little historical support, to the point of contradicting Thucydides. However Plutarch must not be neglected as he had access to other sources which have not survived.[10]

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[8] e.g. Herodt. 7.100.8. & 8.90.
[9] Burn A.R. *Persia and the Greeks*. Duckworth. London.1984,11. et seq.
[10] Plutarch.*The Rise and Fall of Athens*. tr Scott-Kilvert I. Penguin. Harmondsworth. 1975.

Persian logistics

When the Persians absorbed the Assyrian and Neo-Babylonian polities into their empire, the conquerors learned a great deal from them about the movement and supply of large armies over great distances, and put their acquired skills into practice. They certainly did not build roads in the Roman sense, but so improved on the old Assyrian routes, for example the two thousand kilometre "Royal Road" from Susa to Sardis, that they were able to move large numbers of troops and supply them across the wide expanses of their empire. No people could be less thalassic than the Persians, so they sensibly pressed their maritime Phoenician, Ionian and Egyptian subjects into building and manning commercial and fighting ships for their overseas ventures. This did mean however that they had to rely on the sometimes doubtful loyalties of their sea-going subjects.[11] The invasion of Greece by Xerxes in 480 BC in revenge for the defeat of his father Darius by Athens at Marathon ten years earlier was a complex exercise in military logistics, which the king ordered and his "general staff" commenced planning years before the event. Like his successor Thucydides, Herodotus' reports on the discussions between the king and his advisers are almost certainly invented but illustrate some of the logistical problems which had to be solved.

Military intelligence

The Persians were well aware that the Greek *poleis* were habitually warring with each other with armies of almost untrained gentleman soldiers led by amateur officers chosen by lot rather than ability. They knew that Sparta was the only Greek state with what amounted to a professional standing army of only a few thousand men.[12] They would have had a good idea of the size of a combined army which could be assembled by those states prepared to oppose the invaders. They would have known too,

[11] Herodt. 8. 9. and 8. 22.
[12] Anderson J.K. *Military Theory and Practice in the Age of Xenophon.*University of California, Berkeley.1970. 6.

about Themistocles' plans to build a fleet of warships with proceeds from the unexpected find of a rich vein of silver in the Laurium mines.[13]

Planning

Most wars, particularly ancient ones, were fought with the intention of making a profit from booty such as gold and slaves. With the backing of their huge wealth the balance sheet of invasion was of no importance to the Persians. They were well aware that Greece was singularly lacking in resources and sought only revenge for their defeat at Marathon, and in the process, burn Athens to the ground in retaliation for the destruction of Sardis by the Athenians during the Ionian rebellion in 498.[14] Instead of planning an invasion with forces sufficient to ensure victory, they put together at huge cost, a grandiose exhibition of overwhelming strength. The numbers of their army and navy combined being much the same as the total population of Attica.[15]

The Athos Canal

In 492 Darius' fleet invading Greece lost 300 warships in a sudden storm whilst rounding the Athos peninsular.[16] In his turn, Xerxes was not prepared to take the risk of a similar loss to his fleet, and decided that the excavation of a canal through the sandy narrow neck of the peninsula was a fair trade-off. Indeed, the manpower and time needed to build 300 triremes and excavate a canal were probably of much the same order. In recording this venture Herodotus thought that the cutting of the canal was unnecessary. It was begun three years before the army was assembled and was a massive civil engineering effort in itself.

He says that:-[17]

A fleet of triremes lay at Elaeus in the Chersonese, and from this base men of the various nations of which the army was composed were

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[13] Herodt. 7.144.
[14] Herodt. 5.101.
[15] Jones A.H.M. *Athenian Democracy.* Blackwell. Oxford. 1989. 8-10, 76-79,161-180.
[16] Herodt. 6.44.
[17] Herodt. 7.22.

sent over in shifts to Athos where they were put to work of cutting the canal under the lash.

The fact that the Athos peninsula is about 180 km from Elaeus was not considered a difficulty by the planners. Herodotus mentions that the ready-ground meal "in great quantity" for the rations of the canal-diggers was sent to Athos from Asia.[18] Herodotus does not mention how many men were sent to dig the canal, but the task of feeding what must have been several thousands, was an essential but hardly noticed aspect of the forward planning which involved supplying several tons of ground meal daily, for some three years, from an unnamed source some 200 kilometres away on the Asian shore of the Aegean Sea. It is surprising that with food dumps already being established not far away at Eion on the Strymon and Doriscus, that the grain was not supplied from one of them and ground for the canal workers on site. It has been suggested that the workers were paid in cash and bought the meal at a market in the labour camp. This assumption is supported by the finding of a hoard of 300 darics nearby, probably dating from that time.[19] The availability of water in this sandy area must have been a major problem as there is no river nearby, so it was probably obtained from wells dug on site.

This huge excavation task does not seem to have been generally appreciated by historians, some of whom confine themselves to noting that the width of the sandy peninsular at its narrowest is 2.5 kilometres. Hammond however does say that its highest point is 50 feet (15 metres) above sea-level.[20] Xerxes ordered that two triremes should be able to row through the canal side-by-side that is, requiring a navigable width of 20 metres. This has been confirmed by geophysical exploration which has shown a width at the top of 25 to 35 metres and 20 metres at the bottom. Core samples have shown an absence of the remains of marine animals or

[18] Herodt. 7. 23.
[19] Burn: 1984, 318.
[20] Hammond N.G.L. *A History of Greece.* Clarendon.Oxford. 1989. 218.

plants, indicating that the canal had a very short life.[21] If the average height of the isthmus above sea-level from end to end is taken as 8 metres and a depth of water in the canal of two metres sufficient to float the warships, and with the banks sloped at 45 degrees, then between 1.5 and 2 million tons of soil had to be dug out, and carried far enough away from the excavation to avoid the spoil slipping back into the cutting. The only tools would have been mattocks, wooden spades, wicker baskets and ropes for hauling the filled baskets out of the cutting. Bearing in mind that sand has drifted over the millennia, the pictures on the opposite page give some idea of the immensity of the task.

By using the theoretical average cross-section dimensions opposite and accepting that the canal took three years to excavate, it can be calculated that if three men could dig out and carry one ton a day to the spoil banks, then approximately four thousand men would have been employed excavating the canal, the breakwaters at each end, and the coffer dams to keep the sea out until the excavation was complete. Such a number of workers would have needed at least four tons of cereal a day and a similar amount of firewood brought in, as the locality would have soon been denuded of kindling.

This great effort was made for the sole purpose of ensuring that the Persian battle fleet and supply ships would not have to risk doubling the Athos peninsular with its 30 kilometres of dangerous lee shore. Xerxes' fleet passed through the canal just once, its militarily useful life being a few weeks at most. Herodotus would have had the *diolkos* slipway over the Isthmus of Corinth in mind, when he remarked that the canal was a display of sheer ostentation.[22] On the other hand it has been pointed out that the time taken to drag each ship of the huge trireme fleet over the two and a half kilometre-wide sandy isthmus would have taken a great deal longer than sailing through the canal.[23]

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[21] Karastakis V.K. & Papamarinopolus S.P. *The Detection of Xerxes' Canal by Shallow Reflection and Refraction Seismics*. Geophysical Prospecting. May 1997. 389-401.
[22] Herodt. 7.24.
[23] Burn: 1984, 318.

The food dumps

Herodotus says that during the time that the canal was being cut, food dumps were being established, close to the mouths of perennial rivers, along the expected line of march of the invaders.[24] He says that the biggest one was at Leuce Acte in Thrace and names the others, from east to west, at Tyrodiza in Perinthian territory, Doriscus at the mouth of the Hebrus, Eion on the Strymon, and another "in Macedonia". Both Doriscus and Eion had been strongly garrisoned by the Persians since Darius' invasion of Thrace in 492 and were ideal sites for building, filling and maintaining granaries under competent guarding and supervision until they were emptied by the passing army. The Persians probably had little practice in the long-term storage of cereals, but their Egyptian subjects could call on millennia of experience in the building of granaries capable of holding the required tonnages.[25]

Leuce Acte

It is convenient at this point to present an argument for the location of the food store which Herodotus says was "in Macedonia", and show that it was in fact the Leuce Acte which he names but does not locate. All the dumps were of course in Persian controlled or friendly territory. Maurice translates Leuce Acte as "White Beach" and thought it to be at the head of the Gulf of Melas.[26] (See map facing p 37). Other scholars agree with Maurice.[27] "White Cape" has also been suggested which is placed at the western end of the Propontis.[28] Strabo who wrote almost five centuries after Herodotus, locates Leuce Acte in the Hellespont between Aigospotami and Perinthus.[29] "Liddell and Scott" confirm Maurice's translation of *Acte* as

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[24] Herodt. 7.25.
[25] Kemp.B.J. *Ancient Egypt.* Routledge. London. 1995, 173,288,309 etc
[26] Maurice:1930, 219.
[27] Engels D.W. *Alexander the Great and the Logistics of the Macedonian Army.* California.1978. 29
[28] Burn: 1984, 318.
[29] Strabo. Book 7. (Internet search)

"beach" is correct.[30] Maurice's proposed site for Leuce Acte had, by his own observation, two days of near-waterless march on the approaches to both sides of it, which suggests that it was hardly the place for a major distribution point. The name "Leuce Acte" is generic and could have applied to any one of several beaches well-known for having white sand, whereas most beaches are "golden".

The Persians would have planned for an army of occupation to remain in Greece after their expected conquest. In order to keep a large occupying army supplied through the winter of 480-79 it would have been logical to establish beforehand a major supply point as close as possible to enemy territory to minimise the length of an overland supply route when sea-borne supply would not have been possible. It would certainly not have been as far away as Perinthus. It is suggested that the most likely site for a "Leuce Acte" would have been at the head of the Thermaic Gulf (the modern Gulf of Thessaloniki) between the mouths of the Rivers Axios (modern Vardar) and Haliakmon (Vistriza) where there are extensive dazzlingly white beaches popular with modern tourists.[31] However, one must add the caveat that the coastline at the head of the Thermaic Gulf has changed radically since ancient times due to silting by the two swiftly flowing rivers.[32] Another argument in favour of Leuce Acte being at the head of the Thermaic Gulf can be found in Herodotus where he says:-[33]

While the fleet waited near Therma and the Axios...Xerxes with the army was on its way from Acanthus.

And further:-

At Therma Xerxes halted his army and the troops went into camp. They occupied the whole seaboard from Therma in Mygdonia to the Lydias and Haliakmon.....while they were encamped here ,all the rivers mentioned supplied enough water for their needs except the Echeidorus, which dried up.

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[30] The word *acte* seems to cause some confusion being variously translated as "cape", "headland" , "strand" and "beach" It has been discussed at some length by Bowen A. 1998. in an appendix to his paper. He concludes that "beach" is to be preferred.

[31] Internet search "Thessaloniki beaches"

[32] Casson S. *Macedonia, Thrace and Illyria.* Oxford.1926.15.

[33] Herodt. 7.124.

Whilst both the army and the fleet were concentrated at the head of the Thermaic Gulf, three hundred thousand men had to be victualled in the same neighbourhood for the period that the army "went into camp". This could have been possible only if a very large food dump had been prepared there in advance and continued to be supplied thereafter. Another argument in favour of Leuce Acte as the unnamed site being at the head of the Thermaic Gulf can be found in the *Periplous* of the near-contemporary Scylax of Caryanda who wrote:-[34]

.....Beyond Chersonesos is the Bay of Plinthine. The mouth of the bay to Leuce Acte is a day and a night's sail...

One historian adds some weight to this argument by suggesting that dumps were further forward in Macedonia, and mentions Scylax.[35]

A 24-hour voyage to the mouth (not head) of the bay would be about the right distance to the Thermaic Gulf which was in Macedonian territory and about 400 kilometres from Attica. We also know, and Herodotus reports it, that Alexander II of Macedon collaborated with the Persians and permitted a base on his territory, whilst his relationship with the Greeks was at best ambiguous. Furthermore, the suggested site for Leuce Acte was closest the border with Thessaly, the most important Greek state which actively "medised".[36]

Herodotus has nothing to say about the maintenance of the Persian army in its winter quarters at Sardis or the location of other dumps on the route from Sardis to the crossing point on the Hellespont. There certainly must have been food available at the ford over the Scamander. He dismisses the major effort of setting up the food dumps in one short paragraph although food supply was a crucial factor in the success of the venture and an aspect of the Persian effort which needs closer consideration.

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[34] Poathe T. & Svensson G. *From Portolan Charts toVisual Beacons.*Proceedings of the Visual Literacy Association Conference. Newport R.I. 2003.
[35] Burn: 1984, 318. n14.
[36] Herodt. 7.132.

Feeding the Persian army

In 482 the Asian contingents of the army assembled at Critalla on the River Halys in Cappadocia and together with the Near Eastern troops concentrated on Sardis in Lydia where it spent the winter of 481-480. An army is like a city on the move and one must admire the feat of logistics (about which we have no information) in keeping this huge army fed and healthy in bitterly cold Sardis for possibly the three winter months. When in enemy territory, ancient armies "lived off the land" whenever possible, but in their own dominions supplies had to be obtained by less drastic means. It is an important point to bear in mind throughout this study that in the ancient world famine was never very far away.[37] With the exception of Athens, which had long outgrown its agricultural capacity and had facilities for importing grain from the Black Sea wheat lands, ancient communities lived from harvest to harvest and were on short commons in the pre-harvest months.[38] If the harvest was poor the outlook was grim. The arrival of an army in any neighbourhood meant severe hardship for the inhabitants. Herodotus records how the people of Acanthus (who probably had three years of relative prosperity whilst the nearby Athos canal was being excavated), were utterly ruined and stripped of house and home by the passing Persian army, and that was in friendly territory![39] Herodotus' outrage at what must have been a frequent occurrence was echoed by Tacitus six centuries later. *"……they create desolation and call it peace"*.[40]

Until quite recently, historians have paid little attention to the logistics of ancient armies, relying on the assumption that they lived off the land.[41] To understand the magnitude of the Persian effort it is necessary to obtain some idea of the size of the food dumps established along the invasion route and the total amount of foodstuffs needed for the planned

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[37] Jameson M. *Famine in the Greek World.* Cambridge.1983.
[38] Rickman. G. *The Corn Supply of Ancient Rome* Clarendon. Oxford.1980. Chapter 1. & see also Engels: 1978.27.
[39] Herodt. 7.118.
[40] Tacitus. *"Agricola"* Penguin. 30.
[41] Which Xenophon's "Ten Thousand" certainly did in their Anabasis

duration of the campaign. That can only be done by using an acceptable estimate of the size of Xerxes' army derived from a reliable source.

The size of the army

Herodotus makes the often questioned assertion that 1.7 million infantrymen together with eighty thousand cavalry and twenty thousand charioteers- not to mention their camp followers - crossed the Hellespont.[42] An early historian of Greece claimed that "the numbers of Xerxes (army) were greater than any assembled in ancient times, or perhaps…in history".[43] Later historians either accepted Herodotus, or made estimates varying from 1.2 million to three hundred thousand men. The German historian Delbruck posed the question to friends of his on the German General Staff, who estimated an army of sixty-five thousand to seventy-five thousand.[44] Several historians have suggested that there has been confusion of Herodotus' use of μυριος in its original meaning of "countless", and χιλιοι thus inadvertently multiplying his numbers by a factor of ten.[45] It is quite remarkable that no ancient historian of Xerxes' invasion, whose works have survived, from Herodotus onwards, ever visited the Hellespont. More modern ones who might have wished to do so would have been frustrated by the Turkish authorities, as the Gallipoli peninsula was for a long time a sensitive defence area. However in 1922, a British soldier, General Sir Frederick Maurice, on holiday in Istanbul, was able to take his copy of Herodotus and an army map and go over the ground. His observations clarified the problems to the satisfaction of most students of the event.[46] As will be seen below, he concluded that a maximum of one hundred and fifty thousand five hundred combatants together with some seventy-five thousand pack animals was a likely total. Maurice's 75 year-old paper is a fascinating account by a professional soldier of the logistical problems facing the Persian planners in getting their massive army across the Hellespont and into Greece.

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[42] Herodt. 7.184.
[43] Grote.G. *A History of Ancient Greece.* John Murray. London. 1846. 5.49.
[44] Maurice: 211.
[45] Burn: 1984, 327.
[46] Maurice: 210-235.

The Supply Train

If the Persian supply train was of a size and importance to justify the building of a bridge of boats for its exclusive use, it is necessary to get some idea of what was carried by about seventy thousand animals. Although the army consisted of weather-hardened men, it is hardly likely that they slept in the open throughout the campaign, and probably had some form of tent or weather-proof cloak. The most durable material would have been leather. It is suggested that the men would have grouped in a manner similar to the later Roman *contubernia* whose leather tents accommodated eight men. These were carried on mules together with the stone hand-mills used for grinding the grain ration.[47] Using this analogy, some eighteen to twenty thousand pack-animals would have been needed for that purpose alone. The luxurious tents of Xerxes, his generals, and court followers together with their furnishings, mobile kitchens and special foods, would have required many more. The long marches through almost waterless country from the Scamander to the Hebrus would have required large amounts of water to be carried both for men and animals as well as three days supply of grain for the soldiers and fodder for the animals. Speculation could be misleading on the number of pack animals required for those purposes, together with the military hardware such as spears, bows, arrows and armour which was not needed until enemy territory was reached. If the cavalry mounts are included, a supply train of seventy thousand animals is a reasonable assumption.

What was needed

Maurice's estimate of the size of the army, discussed below will be used to calculate how much grain was needed to feed it. It must surely have been the case that only non-perishable foodstuffs would have been stored in the dumps. Herodotus concentrates on the supply of cereals and does not mention whether meat was supplied either dried or on the hoof. Some animals would have been needed for sacrificial purposes and to supply some meat to the high dignitaries. Mediterranean and Middle Eastern peoples were of necessity consumers of cereals although it has

been pointed out that the Persians were herdsmen and hence meat-eaters and probably had to be supplied with salt meat.[48] If that assertion is correct, then an extremely long supply chain had to be set up from the ranches of the Persian interior, to a convenient Aegean port, for example, Adramyttium. For the purposes of this discussion it is assumed that cereals made up a major part of the army's diet whilst on campaign. It must also be borne in mind that the horses, mules and camels also had to be fed with both cereals and forage. Indeed, Roth suggests that fodder was a major logistical consideration.[49] Large tonnages of other foodstuffs such as onions, beans, peas or salt would have been needed as relishes.[50]

It was normal practice throughout antiquity to issue the grain ration to the troops at intervals of three or more days. They then reduced it to a more or less gritty meal with hand-mills, which were carried on pack-animals as part of their equipment. The meal was then baked into flat cakes and eaten with some salt and vegetable relish like onions. This obviously required a fire and hence the need for another major logistical item- firewood. An army remaining in one place for more than a few days swept the surrounding countryside clean of anything combustible. One scholar emphasises this in noting that 1.2 to 1.5 kilograms of kindling is needed to bake one kilogram of flour. An army of one hundred and fifty thousand men would therefore use 60 to 75 tons of wood per day.[51]

In making an estimate of the supplies needed for the Persian forces, it will be assumed that apart from the dumps in Europe there would have been at least one other on the ford over the Scamander, on the march from Sardis to the crossing point on the Hellespont. Estimation of the

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[47] Webster.G. *The Roman Imperial Army.* A&C Black. London. 1981. 169.
[48] Rickman: 1980, 3. & Burn: 1984, 319.
[49] Roth : 1991, 217.
[50] An estimate of the tonnages required would be speculation. Burn: 1984,319. quotes Theopompus' description of the dumps put down by Artaxerxes for his invasion of Egypt in 455:- *Vast herds of baggage animals and beasts for slaughter, bushels of condiments, and boxes and sacks…….there was so much salt meat of every kind, that it made heaps, so large that people approaching from a distance thought they were coming to a range of hills.*
[51] Roth: 1991, 216.

supplies consumed during the over-wintering period at Sardis and indeed where they came from, is too speculative to include in the calculation.

For this purpose, Engels' estimates of the daily cereal requirements of a soldier of the time, the consumption of fodder and grain by cavalry and transport animals are used. In order to simplify the calculations, it is assumed that all the pack animals were horses. It is also assumed that all the ethnic groups in the Persian army were fed from the same supplies. It has been calculated that the minimum ration for a soldier would have been 1.36 kilograms of grain and 2 litres of water per day.[52] A horse requires 4.5 kilograms of straw or chaff, 4.5 kilograms of grain and 35 litres of water. However, a later investigator suggests that Engels' estimate of human consumption is somewhat too high.[53] Whatever the actual daily consumption of grain might have been, the purpose of these estimates is to get some idea of the magnitude of the Persian supply effort.

The Persian soldiers carried three days' rations, the dumps being three days march apart. Much of their water requirement of about two litres a day was carried on pack animals. This meant that each of the dumps between the Scamander and Eion would have held three days' requirement of cereals for one hundred and fifty thousand men and seventy thousand horses.[54] Using the numbers quoted above, that requirement would have amounted to 612 tons of cereals for human consumption plus 500 tons each of fodder and grain. Thus, to feed the army on its march through friendly territory from the Scamander to Macedonia, a total of three thousand and sixty tons of grain for immediate human consumption and five thousand tons of animal feed had to be procured and delivered to the five dumps.

Before the army moved into Greece, the dump at the head of the Thermaic Gulf would have had to supply four hundred tons of cereal for the men and almost as much for the transport animals for each of the unrecorded number of days which Herodotus says that the army and navy

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[52] Engels: 1978,18. See also Gabriel & Metz: 1991, 23.
[53] Roth J. *The Logistics of the Roman Army at War.* Brill. Leiden. 1999.164.
[54] Maurice: 228.

"went into camp".[55] Thereafter it would have been the logical supply point for the army of occupation, particularly during the winter months when supply by sea was not possible. All of the dumps would have had to be supplied by merchant ships unloading on to beaches, except possibly at the port of Eion on the Strymon . Consequently there must have been a risk of spoilage of the grain by water en route. Cereals have to be stored in dry, cool, insect and rodent-proof granaries which had to be built and then maintained and guarded from the time they were filled until they were emptied by the passing army.[56] If it was intended for the dumps to supply the returning victorious army, the tonnages would have had to be doubled. Herodotus relates that after Salamis, Xerxes marched back to the Hellespont in forty-five days with that part of his army escorting him living off the country as best they could.[57] He says that they ate grass and tree-bark to stay their hunger which implies empty granaries along the route. This story cannot be accepted without question. The patriotic Herodotus might have wished that Xerxes and his army had a bad time getting out of Greece. There was no way the Great King and his swarm of high-born functionaries would have gone hungry. As has been mentioned above, the meticulous Persian planners must have taken into account the certainty that a substantial part of their forces, both army and navy, would have had to winter in Attica and Thessaly as an army of occupation, whether or not there had been a naval engagement or a land battle. The army had reached Athens at the end of the sailing season in September, and the fleet, had it not been defeated, would have been beached at Phaleron for the winter. The Persian planners knew very well that there would be very little sea-borne supplies from late September until the following April. They knew too that the agricultural potential of peninsular Greece could not possibly feed the remaining part of the army and the navy combined. The pack animals which accompanied the invaders would have been

[55] Herodt. 7.127.
[56] Rickman: 1980, 21.
[57] Herodt. 8.115.

unloaded as soon as the army reached Attica.[58] They would have then been organised in convoys and sent back to the supply dump which was probably "Leuce Acte" at the head of the Thermaic Gulf to reload and maintain an overland shuttle service through the winter (see map facing p.46). This 400 kilometre-long supply route was hazardous, the convoys being at risk of attack by guerrilla bands in Phokis.[59]

If this is a reasonable conclusion, the tonnages of grain as calculated above will serve for the three easternmost dumps, but the westernmost at "Leuce Acte" must have been many times bigger and continuously supplied right through the sailing season. Whatever the correct estimate of the amount of foodstuffs delivered to the Persian forces might be, it required a major long-term logistical effort to supply very large quantities of foodstuffs for men and animals to properly built granaries at carefully selected distribution points, and redistribute to the forces either as they marched or sailed past or keep them fed through the approaching winter.

The source of cereals

The question then follows, where did the grain and fodder come from? Little if any could be supplied from Anatolia or overland from Asia. There were two possible sources, either Egypt, a long windward voyage away, or, much more likely, from the Black Sea littoral, where Persian influence was strong. It must also be borne in mind that at that time there was already a well-developed grain trade between Athens and other Greek cities and the Black Sea wheat-lands, which must have come to a sudden end with the Persian crossing of the Hellespont.[60] Herodotus relates how Xerxes allowed Greek grain ships sailing down the Hellespont to go

[58] Maurice: 228.
[59] Perhaps after Herodt. 8.38.
[60] Burn: 1984, 552.

unmolested as they were doing a supply job for him.[61] The Black Sea option would also have had the advantage of an easy down-wind passage direct to the coast of Thrace.

Shipping the supplies

The necessity of keeping the grain dry in granaries has already been mentioned, but the cargoes of cereals had to be kept dry during transport in the supply ships. An expert in ancient shipping asserts that grain was carried in sacks.[62] The risk of spoilage must have been great and the possibility considered that grain could have been kept dry by transporting it in amphorae. The Athenians and other Greeks manufactured amphorae in which they exported wine and olive oil. Although no evidence has been found to suggest such a practice, the grain for which the wine and oil was traded could have been filled into the emptied amphorae for the return voyage. However, the supplies for the Persian army could not be delivered in amphorae unless there was a pottery industry in the Black Sea grain supplying areas to manufacture the very large numbers needed. Furthermore, no archaeological evidence has been found for amphorae, whole or fragmentary, at the sites of the dumps. In any case, if amphorae were used, a considerable proportion of the carrying capacity of the ships would have been taken up with the mass of the containers. As the carrying of grain loose in the holds of the ships is doubtful, there remains only the possibility that the grain was carried in sacks of some sort. This in turn supposes the existence of a linen weaving industry on the Black Sea littoral, flax being a very widespread crop and probably cultivated in the wheat growing areas of the Black Sea. Such sacks would not have been

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[61] Herodt. 7.147. Although the Greeks must have been well aware of the impending invasion, it is likely that Xerxes practiced psychological warfare by allowing the crews of a few grain transports to spread the news of his enormous army descending on Greece. The bridge of boats was in place and every ship coming down the Hellespont had to pass the passages through them. Cargoes of wheat for Greek ports would surely have been commandeered and re-routed to one of the food dumps in Thrace. As the Persians still controlled Black Sea and Egyptian wheat sixty-five years later, this cutting off of supplies could have been early notice to the famine-prone Athenians of the need for unrestricted access to a reliable source of grain, a major motivation for the Sicilian Expedition.

[62] Casson.L. *Ships and Seamanship in the Ancient World.* Johns Hopkins. 1995. 200.

waterproof. The only likely alternative would have been the use of reasonably waterproof bags made from the whole hides of animals such as cattle or goats. Leather bags of this sort would have been durable and reusable, but needed in such large numbers that heavy and possibly unfulfillable demands would have been made on the relatively small cattle herds of peoples who were essentially cereal eaters. Roth however is of the opinion that grain was shipped loose, the cost and availability of leather bags precluding their use.[63] Whichever method of transport was used, by the time the rations were issued to the army and navy, a proportion would have been mildewed or otherwise damaged and unpalatable. This is a possible explanation for Herodotus' report that the part of the army returning to Asia with Xerxes had to live off the land.

Persian doubts

Not all the Persian general staff agreed with the viability of the planned invasion. Herodotus tells us that Artabanus offered the king a lesson in logistics, saying in part:-[64]

If you increase your forces the two powers I have in mind will be worse enemies to you than they are now....the land and the sea. There is not a harbour anywhere big enough (for) our fleet. If you meet with no opposition, the land itself will become more and more hostile...the mere distance will ultimately starve you.

Xerxes must have been given some misleading information as he not only rejected Artabanus' advice and that of Demaratus the deposed and refugee king of Sparta.[65] The former was sent back to Susa after being told that the army would take plenty of supplies with it and in any case they would have plenty of grain as the countries they would pass through were occupied by agricultural peoples and not nomads.

The Persian fleet.

Herodotus reports that the Persian army was supported by an enormous fleet of 1320 warships.[66] Here again credulity is strained. The interesting suggestion has been made that Greek spies counted as part of

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[63] Roth J. Personal communication. See appendix 3.
[64] Herodt. 7.49.
[65] Herodt. 7.102-4.
[66] Herodt. 7. 89.

the fleet, the 674 ships being assembled for the bridges of boats across the Hellespont.[67] If that number is subtracted there still remains a massive armada of 653 triremes plus about 2300 supply ships. Bury and Meiggs make a guess of "perhaps 800".[68] Hammond does not question Herodotus.[69] Strauss does not suggest a lower number but allows for its reduction to more believable proportions by accepting Herodotus' probably invented storm and battle losses in order to arrive at a sensible number at Salamis.[70]

For the purpose of this discussion a fleet of 653 triremes is accepted as a reasonable estimate while the remainder were used to support the bridge of boats. The Persian warships had a complement of 230 which means there were about one hundred and fifty thousand crewmen who had to be supplied with food and water daily as little, if any, supplies were carried aboard the crowded warships. The navy was almost the same size as the army, but with this difference, that the fleet could not be supplied from the food dumps but had to find suitable beaches where the warships and the merchant ships supplying them, could go ashore every evening. The daily grain consumption of one trireme crew would have been about 315 kilograms and thus about 200 tons for the fleet.

One expert claims that the carrying capacity of a merchantman of the time was about 70 to 80 tons, so that three could theoretically supply the fleet for one day.[71] The nature of the coast is such that the fleet would have been strung out over a considerable distance looking for beaches where the ships could be hauled out and the crews fed and rested. It is assumed here that in order to ensure reliable food supplies to the crews, one merchant ship would have serviced two warships. Rounding up the numbers, 350 supply ships carrying twenty-six thousand two hundred tons of grain could supply the fleet for 130 days, which is a little longer than the time the fleet took to reach Phaleron after it assembled off Cape

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[67] Burn: 1984, 337.
[68] Bury J.B. & Meiggs R.*A History of Greece*.MacMillan.London.1989.169.
[69] Hammond: 1989,229.
[70] Strauss B. *Salamis ,the Greatest Naval Battle of the Ancient World.* Hutchinson.London. 2004. 20.
[71] Casson : 1995,171.

Sarpedon.[72] The difficulties in giving instructions to polyglot merchantmen supplying equally polyglot trireme crews can only be imagined.

That is not all, once beyond the last of the food dumps and across the River Haliakmon, the army marched into mountainous country in which it certainly could not live off the land, so it too had to be supplied from the sea by about the same number of merchantmen, and twice as many again with grain and fodder for the horses. Herodotus' figure of about two thousand three hundred supply ships is not as unlikely as it seems at first reading.[73] The supply chain must have been severely strained, if indeed it sometimes failed altogether in trying to get supplies from beaches to the troops marching somewhere inland on the tracks which passed for roads in ancient Greece.

Routing of the supply ships

Another intriguing aspect of the food supply effort is how the supply ships, coming down the Hellespont, were instructed where they had to go to unload. It is a reasonable assumption that they would have called at Sestos or Abydos in the Hellespont, or, perhaps more likely, at the bridge of boats as they passed through it, to get delivery orders from a Persian official stationed there. That official also needed to be informed himself, perhaps by the well-organised Persian courier service which Herodotus admired.[74] It is perhaps more likely those instructions were delivered by a fast despatch boat, probably a penteconter, sent from the fleet as it moved southwards along the coast. If these are reasonable suppositions, then it must also be accepted that even quite junior Persian officers were literate. One can go further and suggest that without the use of written instructions, the whole enterprise would not have been possible. A further complication would have been the need for multilingual messages if Darius' Behistun inscription is indicative of the nature of internal communications within the Persian Empire. In view of the long presence of Greek commercial interests in the

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[72] Herodt. 7. 58.
[73] Bearing in mind that Herodotus does not take the transport of dried meat and vegetables into account, the number of merchant ships becomes even more believable.
[74] Herodt. 8.98.

Aegean and Black Seas, it is probable that the maritime *lingua franca* was Greek.

Total cereal requirements for the campaign

To sum up, the delivery of cereal to the combined Persian forces, between the time the army left the Scamander about the first week in May, and the defeat of the navy at Salamis on or about September 25th, some 140 days later, the combined forces of three hundred thousand men consumed fifty seven thousand five hundred tons of grain and their seventy five thousand pack animals a further forty seven thousand tons of cereal and a similar amount of fodder. The amount of cereals required for the combined army and navy for six months has been confirmed by an authority on Roman logistics whose estimate for a six-month Roman campaign gives a pro rata amount of forty nine thousand tons.[75] These tonnages do not include the consumption of grain by personnel in the supply columns and the non-combatant camp followers, nor has the supply of vegetables such as onions and beans, or of salt, wine and so on, been considered. To these numbers must be added the food consumption of the army of occupation for almost a year in Greece between Salamis and Plataea.

Herodotus calculated daily grain consumption for the combined forces and arrived at the very much greater amount of three thousand seven hundred and fifty tons per day.[76] If this number is divided by the 5.28 million men he claimed for the total Persian force then each man would have had an inadequate daily ration of about 600 grams of grain.[77] No matter which number is nearest the actual amount, we have an indication of the magnitude of the grain-producing capabilities of the Black Sea littoral, and the Persian ability to move large tonnages of it to their forces in an operation lasting several years. We do not know whether the Persians paid their suppliers from their enormous reserves of darics, or simply appropriated what they needed. The question then arises, who consumed

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[75] Roth : 1996,193.

[76] Herodt. 7.187. It is possible that he omitted to mention the possibility of a daily ration of meat.

these huge amounts of grain before and after the period of the Persian demand for it? It has been mentioned above that the population of Attica was of the same order of magnitude as the combined Persian forces. A likely assumption is that grain which should normally have been carried by the Athenian grain trade was diverted to the Persian dumps. If this was so, the Athenians either went short or had to supplement their supply from possibly Egypt via the Greek "treaty port" they founded at Naucratis in the Nile delta, or from Sicilian sources, for some three years before Xerxes' actual invasion. The Athenian aristocracy scorned to take a direct part in trade, leaving grain importation entirely in the hands of private entrepreneurs many of them foreigners or metics.[78] The merchants must have given the Athenians warning of the Persian appropriation of Black Sea wheat in preparation for the coming invasion. Furthermore, the Persians must surely have commandeered a large part of the merchant marine available in the Aegean and eastern Mediterranean to carry cereals from the Black Sea to Thrace. This must have severely damaged maritime trade throughout the Levant. This could be seen as deliberate economic warfare on the part of the Persians rather than merely incidental to their planning.

The bridges of boats

Turning now to the bridges of boats, Herodotus gives us quite a lot of information about what was a major feat of engineering, but frustratingly omits some important detail. He does not tell us how long beforehand or where and how the 674 triremes needed for the two bridges of boats were obtained. An attractive suggestion has been made that some might have been old ones left over from the Marathon campaign of 490.[79] Before the orders to build or acquire the ships could be given, the numbers which would be needed had to be calculated from accurate measurements of the width of the Hellespont at the identified crossing points. This immediately

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[77] Herodt. 7.188.

[78] Calhoun.G.M. *The Business Life of Ancient Athens.* Beard Books.Washington D.C.1924. 43 et seq.

[79] Burn: 1984, 321.

raises another question, who did the surveying and by what method? Likely candidates were the Egyptians, who from earliest times were skilled in surveying through annual necessity, would have been given the task.[80]

The steep and rocky shores of the Hellespont would have precluded estimating the width by the well-known ancient method of similar triangles.[81] It is more likely that the width was measured physically by counting the number of times a long rope of known length was stretched from one shore to a manned ship which was anchored when the rope was taut. Then the shore end would be passed to a second ship which anchored broadside to the first when the rope was again taut, and repeating the process, the first ship moving to the far side of the second and so on, until the straight was crossed. At the same time the lengths of anchor cables could be determined, the average depth of the Hellespont being about 60 metres.

The Trireme

In order to get an idea what the bridges of boats were like, and understand the nature of early fifth century marine warfare, it is necessary to describe the trireme. By the time of the Persian invasion it had been already about a century in development around the Eastern Mediterranean. The somewhat smaller, undecked penteconter, also mentioned by Herodotus, was of similar hull construction, but open and undecked. The trireme, with local variations, was the warship universally used by the eastern Mediterranean maritime powers (see attached illustration). The triremes of the Persian fleet, particularly those supplied by the Phoenicians, were in terms of their length, breadth and crew numbers, the biggest ships of their day. Their hulls could be easily adapted to serve as supports for the bridge of boats, by removing their light decking and the outriggers for the uppermost tier of oars. (See the attached illustration of the suggested arrangement). Their waterline length of some 32 metres and

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[80] Dilke.O.A.W. The *Roman Land Surveyors* David & Charles. London. 1971.70. et seq

[81] Dilke: 1971, 61. If the sea-level had been 1.5 metres lower (see footnote 88) then there might have been a beach wide enough to allow a survey by the method of similar triangles.

beam of about 5 metres would allow for the widest possible bridges with the maximum load-carrying capacity. In their designed role as warships the Persian ships were built and crewed by Ionians, Phoenicians, Sidonians and Egyptians. It is remarkable that although there was a total absence of ship-building timber in Egypt itself, the Egyptians were able builders and sailors of triremes.

The normal working load of a trireme would have been some 14-16 tons. When afloat in calm water the lowest oar ports were about 30 centimetres above the water-line.[82] These ports were normally fitted with leather sleeves to keep out waves and oar-splash. The triremes assigned for supporting the bridge would presumably have had those ports permanently sealed as the hulls rode lower in the water due to the heavy load of the bridge cables, decking, men, animals and equipment crossing the bridge. The Persian engineers must have estimated the total mass of the ropes and decking and traffic each boat had to carry, and how much freeboard would remain.

Triremes were warships with no commercial use whatever and represented a peak in ancient "high-tech" ship-building achievement. They were very expensive to build and maintain in sea-going condition. For example, each Athenian trireme cost a talent a month to maintain at sea when on active service.[83] The Athenian ships were slightly smaller than those in the Persian fleet. They had a draft of 1.1 metres at 40 tons displacement.[84] As the trireme hull was very long in relation to its depth, it was liable to "hogging" that is, bending in the middle as it passed lengthwise over waves. To minimise movement of the planks, which were butted together, they were held tightly by twenty thousand tenons locked in place by hard-wood pegs cut to fine tolerances.[85] The hull was stiffened by the *hypozomata* or undergirdles, two stout ropes, running the length of the ship and firmly attached to the bow and stern posts. The two ropes were twisted

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[82] Morrison J.S. & Coats J.F. *The Athenian Trireme.* Cambridge.1988.199.
[83] Thuc. 6. 31.3.
[84] Coats et al. *The Trireme trials 1988.* Oxbow. Oxford.1990. 3
[85] Morrison & Coats: 1988,184.

together until tight and then tightened some more when the ship was afloat.

Persian and Greek triremes alike, were powered by 170 oarsmen in three tiers, hence the name. When on passage, square-rigged sails were set to assist the oarsmen when the wind came from astern or on the quarter. When about to go into battle the trireme became a missile intended to ram the enemy, break as many oars as possible or sink the enemy ship, which, being of all-wooden construction, broke up, and the wreckage floated away. It was usual before going into battle to take the mast, yards and sails ashore so that the crew and combatants were not impeded by obstructions on the decks. The crew on an Athenian deck was made up of ten each of officers, seamen and "marines" (*epibatai)*. The shallow draft of the ships made them so unstable that the marines were trained to throw their spears sitting down on the light deck which protected the oarsmen from the heat of the sun and gave some cover from enemy missiles. The bigger Persian ships had thirty soldiers aboard, usually archers who had the additional duty of keeping their eyes on the not always loyal crew.

The poor sea-going abilities of the Athenian trireme of the day usually limited its operational use to inshore waters and most sea battles were fought close to land and indeed, sometimes ashore, such as at the Athenian disaster at Aigospotami. There was no room in the crowded hulls for more than very limited supplies of food and water, hence it was usual, but not the rule, for the warships to be at sea during the daylight hours and then only in relatively calm conditions, coming ashore in the evening for food and water and overnight rest. As will be seen below these limitations were important factors which were either neglected or taken as an acceptable risk by the Persian planners.

As water-proofing of the hulls was primitive or totally lacking, the working life of a trireme was about twenty years if not lost in battle. In that time it deteriorated from a "fast" battleship and after about ten years had become a "slow" one as the hull absorbed water and was attacked by the damaging *teredon* or "ship-worm" (which made holes in the planking), and attracted marine growth. When too slow for battle it would be

downgraded to a trooper, one tier of oarsmen being taken out to accommodate about eighty soldiers. If it lasted long enough, the old ship finally became a horse transport with a further reduction in oarsmen, before being abandoned and left to rot on a beach.

The papyrus and flax cables

The Persian army was well on its way from Sardis to the completed bridges when a storm broke them up. The job was done again with stronger cables to hold the ships together. Presumably most of the hulls were recovered and the relatively few damaged ones replaced. Herodotus was told that the ships which carried the bridges supported six cables, two of flax and four of papyrus, each seven stadia, or about a kilometre long. He was quite right about the width of the Hellespont at its narrowest being seven stadia, or about a kilometre, but he did not know that there are no beaches on either side at that point. Maurice found that the nearest sites with beaches on both shores opposite each other are some seven kilometres to the north, where the channel has a deep embayment on the Chersonese side making it a lot wider. With the aid of a British army map, probably compiled during the Gallipoli campaign of 1915, Maurice showed that at the most likely crossing points, the bridges would have been 3.87 and 3.39 kilometres long respectively.[86] These distances compare very well with the distance occupied by the 360 triremes for the longer and 314 for the shorter bridge as reported by Herodotus, multiplied by their beam of 5.5 metres and 5 metres apart which gives 3.78 and 3.30 kilometres respectively. However, it is necessary to add a caveat. Hammond and Roseman have noted that since the publication of Maurice's paper, geological research has shown that the level of the Aegean Sea was 1.5 metres lower in antiquity. They also quote the "Black Sea Pilot" which warns that "a shallow bank extends over half-a-mile offshore in some places", and add the observation that Maurice (a soldier) did not take the counter-currents in the Hellespont into account in his placing of the bridge sites.[87] If

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[86] Maurice: 217.

[87] Hammond N.G.L. & Roseman L.J. *The Construction of Xerxes' Bridge over the Hellespont* J.H.S.116.1996. 90-1.

their view is correct, then the 360 and 314 triremes and pentekonters supporting the bridges would have been touching each other across the width of the Hellespont at its narrowest point. The assembling of the boats and anchoring them in place would have required a large number of skilled sailors, probably fishermen recruited from ports up and down the Hellespont which was famous for its tunny fisheries. Herodotus notes that especially heavy anchors were used, one thousand three hundred and seventy eight large blocks of stone![88]

The manufacture and installation of the cables was a major logistical problem. The only source of papyrus was Egypt. Herodotus reported that the cables weighed a talent per cubit which gives a diameter of 25 centimetres with a breaking strain of about sixty-six tons.[89] It is unlikely that the Egyptian craftsmen had ever before made cables more than a quarter of the diameter of those required for the bridges. They would have had to learn a new technique on site, of laying so many more strands of yarn together. It is not surprising that the cables on the original bridge broke in a storm. It would seem that the Persian desire to overawe their enemies extended to the making of enormous cables when eight times as many, that is, forty-eight cables, with a diameter of 9 centimetres would have been easy to handle and of equal combined strength.

If Maurice's proposed siting of the bridges is correct, each cable weighed about 175 tons for the longer bridge and 153 tons for the shorter one, i.e. a total of over 1300 tons of papyrus cable plus about 650 tons of flax needed for the other two cables. About half this tonnage would have been required for the shorter crossing. Thus, each trireme supported 3 tons of cable. We do not know whether the planners had the cables woven in Egypt and sent to the Hellespont by cargo ship (a long and slow windward voyage of at least 1200 kilometres) or alternatively, sent the raw papyrus and Egyptian craftsmen to weave the cables on site. Herodotus does give a clue. He relates that:-

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[88] Herodt. 7.36.

[89] Herodt. 7.36. See appendix 1 for calculation of the diameter and further comment.

...a Persian named Oeobazus, (who) came from Cardia, where he had stored the cables used in the construction of the bridges.[90]

As the word "stored" is used it is more likely that woven cables, whole or more probably, in lengths to be spliced together, were shipped from Egypt. Whichever way it was done, the cables still had to be transported over some 50 kilometres of difficult country, or 200 kilometres by sea from Cardia at the head of the Gulf of Melas (see map, page p 38) to the planned beach-head. Hammond and Roseman take the other view and suggest that raw papyrus was transported from Egypt to the site and the cables woven in complete lengths of 1700 metres, the Egyptian rope-makers moving their equipment from one supporting trireme to the next.[91] Whichever method was used, a large number of Egyptian rope-makers had to be imported and housed and fed. The need to supply them might have been the reason why ready-milled grain was sent from the Asiatic shore not only to the canal workers at Athos, but could also have been supplied to the bridge workers as well.

As has been noted above, flax was a common crop in the Middle East so that the weaving of flax ropes could be done much closer to the site and sources of the fibre not such a problem by comparison. It can only be conjectured how the six massive cables were laid from ship to ship across the width of the Hellespont to hold the bridge together and provide a base for the roadway, (which would have been about 20 metres wide) laid over them. One historian who had not seen the site, and obviously was no seaman, speculated that the bridges were at the narrowest point of the Hellespont, and the cables floated down to the boats and hoisted aboard.[92] This would not have been possible as the cables would have fouled the anchor cables and become unmanageable in the 10 kilometres per hour current.[93]

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[90] Herodt. 9.115. Another translation uses the word "tackle" for "cables".
[91] Hammond & Roseman : 96.
[92] Burn: 1984, 320.
[93] Moorehead A. *Gallipoli.* Hamish Hamilton. London. 1958.

It seems more likely that as the cables were probably woven in Egypt and shipped in convenient lengths to fit into the holds of the cargo ships and then spliced together on the bridge of boats by Egyptian experts. Herodotus relates that the cables, once laid across bridge of boats, were "hauled taut by winches ashore". He adds that after the installation of the ropes across the moored triremes, a roadway was laid by means of planks the length of the ships, laid edge to edge and lashed to the ropes. Brushwood was laid on the planks and then a layer of tamped down earth and finally a screen on each side so that the transport animals were not frightened at the sight of water.[94] This was a massive task in itself. The Chersonese and the Asian shores are largely rocky and treeless, the nearest forests being in Thrace across the Gulf of Melas. Assuming that it would have been easier to cut straight pine or fir trees 20 metres long and 20 centimetres diameter, then some thirty five thousand trees would have been required. The felled trees would then have had to be lashed together in rafts and towed across Gulf to the bridges. Brushwood was probably easy to find, and the soil used was likely to have been beach sand.

Passing ships through the bridges

Herodotus reports, without explanation, that three gaps were left in the bridges to allow vessels to pass through.[95] This must surely mean ship passages were constructed at both the shoreward ends of one bridge (probably the upstream one) and one gap probably at the Chersonese end of the other. One can only speculate how this was done. All types of sailing ships of the time had masts which could be easily unstepped. A passing cargo ship would have needed headroom of two metres at the most with its mast unstepped in order to pass under the bridge cables. With that in mind, it is suggested that the simplest solution to the problem would have been for four triremes on each side of each "gap", that is, 24 altogether, to have been modified by fitting baulks about twenty metres long lengthwise, raised by 25, 50, and 75 centimetres and one metre successively above the deck level, to lift the road over the cables by a

[94] Herodt. 7.36.
[95] Herodt. 7.36.

gentle slope to about 2 metres above water level which would have been sufficient for a merchant ship to pass underneath. (See illustration of a possible arrangement, p 27)

The operational life of the bridges

It can be reasonably assumed that the Persian planners expected the bridges of boats to remain serviceable long enough to be recrossed by most of the army returning to Asia after an expected rapid conquest of Greece. Such expectations were not realised. The Battle of Salamis was fought about September 25th and Xerxes left the scene shortly afterwards reaching the probably unusable bridges 45 days later, that is about November 5th, well into the stormy winter season.[96] The possibility of the bridges surviving the winter was remote. A modern author says that after a severe winter the narrowest part of the Hellespont is blocked with drifting ice-floes. Had the winter of 480-79 been a cold one, ice-floes would have ensured the destruction of the bridge.[97]

It has already been mentioned that the water-proofing of the trireme hull was primitive so that triremes with more than ten years service and no longer battle-worthy, would have been ideal for supporting the bridges of boats. Those assigned to support the bridges had to be sailed to suitable beaches along the Hellespont within easy reach of the intended crossing points. Once there, the light decks and outriggers would have been removed in preparation for their role as supports for the bridges. They would then have been moved to beaches as close to the site as possible until the Persian engineers were ready to build the bridges. As triremes were built for acceleration and speed, they were not protected below the waterline by a thin sheet of lead as were cargo ships.[98] The lack of waterproofing meant that the warships had to be beached and allowed to dry out at every possible opportunity to minimise the uptake of water by the timbers. Although Homer uses the epithet "black" implying that ships were waterproofed with pitch or bitumen, there is no evidence for this practice in

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[96] Herodt. 8.115.
[97] Moorehead: 1958.
[98] Casson: 1995,195.

either Greece or elsewhere in the fifth and fourth centuries.[99] During the winter months, triremes were sheltered in boat sheds to keep them dry. If the supposition is correct that the ten-years and older survivors from the Marathon campaign might have been used to support the bridges, they would have already become partially waterlogged and leaky before construction of the bridges had started. Their remaining life-span whilst permanently in the water would have been greatly reduced and an important factor in the useful life of the bridges. The planners must have realised that the bridges would not have lasted more than a few months, even without possible storm damage or use. If the army was to recross the bridges into Asia, a quick victory was essential.

After the battle of Mycale which took place the following summer, the Greeks sailed to the Hellespont to destroy the bridges and found them already broken up.[100] This is hardly surprising, as the already partially waterlogged ships left permanently afloat supporting the bridges, would have deteriorated very rapidly. The short life of a trireme when not regularly dried out, is vividly illustrated in a letter written some 65 years later by the Athenian general Nicias besieging Syracuse, in which he says inter alia:-[101]

...our fleet was originally in first-class condition; the timbers were sound....Now however the ships have been at sea so long that the timbers have rotted...

Why a bridge of boats?

Why did the Persians go to the extraordinary trouble of building the bridges of boats, particularly if their experts had made them aware that the useful life of old triremes continuously afloat could be measured in months at best? As an alternative strategy they could have used some of the ships that had been assigned for the bridge, to ferry the troops across to Thrace. The Persian equivalent of a general staff had a good knowledge of the geography of the Hellespont and must have done their arithmetic. They knew that a trooper trireme could carry 85 soldiers and possibly cram in 100

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[99] Morrison & Coats: 1988,187.
[100] Herodt. 9.114.
[101] Thuc. 7.12.4.

men for the short trip of 4 kilometres.[102] That meant making 1 550 round trips which had to be completed in seven days, which required 220 trips per day. As the current in the Hellespont is very strong, an estimate of four hours per round trip, and 10 hours of daylight would allow two and a half trips per day which demands 88 trooper triremes and almost nine thousand men to row them. As the beaches were not wide enough to accommodate so many triremes only a few ships could be beached at the same time. If the transhipment of the army took any longer than seven days there would be a serious food and water problem both for the troops waiting to cross and those the other side. Additional time would have been required to ship the horses, mules and camels, if indeed they could be persuaded to get aboard ships.

An alternative possibility would have been to march to the narrowest point on the Bosporus which is only 750 metres wide where boats or even large rafts would serve instead of a bridge. This solution would entail another 700 kilometre march to the Bosporus and then back down the coast of Thrace, which would take more than a month with massive additional supply problems and the very real possibility of the whole army having to over-winter in Greece.

If pack animals could be loaded on to transports, the army could be ferried straight across the sea from the Scamander or other Troad ports, to the friendly shores of the Thracian coast. An objection to this would be that the transports would be easy pickings for Greek warships, and in any case Artabazus had pointed out that there are no suitable ports in the Troad.[103] Therefore a bridge would have to be built. Maurice concluded that a bridge was the only possible military solution, but a modern historian believes that, like the Athos canal, the bridge was built as much for prestige and a show of strength as for its functional role.[104] If the Persians, much against their nature, had been content with an invasion force a third of the size, (which would have still been much bigger than the combined Greek

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[102] Casson : 1995, 93.
[103] Herodt. 7.49.
[104] Strauss : 2004, 53.

forces), shipping of the troops across to Thracian landing points would probably have been an attractive solution.[105]

Availability of water

Consideration must now be given to the most difficult logistical problem faced by the invaders. Herodotus mentions it several times, and Maurice keeps returning to it – the supply of water. It must be borne in mind that the army consisted not only of men but also a very large number of pack animals, both horse, mules and camels, which needed large volumes of water. The river Scamander was the last water source on the Asian side of the Hellespont able to support the needs of the army and its animals. It was at this point that Xerxes was faced with a serious and unexpected problem when a storm broke up the bridge. We do not know how long it took to repair the bridge. Even if the damage was easily repaired, a few days delay must have seriously upset the timetable. No wonder Xerxes lost his temper and had the Hellespont whipped and branded with red-hot irons.[106] Whilst waiting for the bridge to be repaired, the army and its baggage train still had to be fed, using up supplies which had not been planned for, thus compromising stocks intended for later use. Furthermore, the season was advancing and rivers and streams were drying up. To give some idea of the problem, Maurice points out that General Allenby's army of fifty-six thousand men and twenty-six thousand pack animals, (an army a third of the size of the Persians') at the battle of Gaza - Beersheba in 1917 used a minimum of 1.6 million litres of water a day which is about the same as the contents of a municipal swimming pool.[107]

The Persians were thoroughly familiar with the geography of the Chersonese, being able to call on the knowledge of local fishermen, and merchants who had plied between Asia and Europe for many generations. Hence they could plan a route from the Scamander to the Hebrus River, which was the next reliable source of water (at the top left of the map on

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[105] See Chapter 4 for discussion on Alexander's army crossing the Hellespont by ship.
[106] Herodt.7.35.
[107] Maurice: 221.

the facing page). The 220 kilometres from river to river had to be completed in seven marches, with very limited water available along the way.

It is an inescapable fact of equine life that ridden or loaded horses and pack animals cannot travel more than seven consecutive days without a rest day otherwise their backs are damaged.[108] A rest day uses up as much food and water as a marching day, so no more than seven marches between river and river was essential. Food was not a problem as there was a food dump and a good beach for supply ships at a location Maurice thought to be Herodotus' Leuce Acte at the head of the Gulf of Melas where water was also available from the nearby perennial river Melas.

Crossing the Hellespont

There is some doubt about the month of the year that the army crossed the Hellespont. Herodotus mentions an eclipse of the sun at that time; unfortunately, he got it wrong. Maurice suggests that the likely date on which the Persians commenced their march from Sardis to the Scamander was May 7th with the army crossing of the bridge of boats between May 12th and 16th.[109] Strauss suggests a date in June which was well into the dry summer season. The first day's march of the leading troops, which Herodotus says were the ten thousand "Immortals", would probably have been from the Scamander to a small river at Abydos, near the eastern end of the bridge at point 1 on the map.[110]

Two bridges were a military necessity because the narrow tracks in the Chersonese required that the supply column, unusually, had to march in parallel with the troops. The route lay more or less northwards up the Chersonese along a narrow defile in the mountainous peninsula, wide enough for two men marching abreast with a file of transport animals beside them. As the army was marching in friendly country it was not necessary to take up defensive positions, but simply bivouac where they halted. Maurice suggests that the "Ten Thousand" started marching at 5 am

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[108] Engels: 1978, 29.
[109] Maurice: 223.
[110] Strauss: 2004, xi.

on the first morning and marched for 8 hours, the head of the column reaching point 2 on the now dry River Aigospotami. The tail of the column would then be about 24 kilometres beyond the bridges. After a bivouac of ten hours the column would recommence its march. Meanwhile, the next division of twenty thousand men had commenced marching at 5 pm from point 2 and by 11 pm would be closing up on the tail of the "Immortals" and follow behind for two hours until it too stopped for a ten hour bivouac. The next column would start over the bridge at 7 am the third day and so on until completed on the sixth day. Herodotus was correct in saying that it took seven days and nights for the army to cross the bridge, but it was not a continuous process but a progression rather like a centipede. Herodotus reports that the army was "under the lash" crossing the bridge. Maurice says that the ground rises steeply from the beaches and a natural tendency for men and animals to slow down on the steep climb to level ground would have led to crowding on the bridge, so men and animals were urged to move smartly with the whip.[111] Referring to the map, the two marches from the watering point numbered 4 on the River Melas to point 6 at Aenas was also along a narrow defile, and being waterless along its whole length was particularly trying for the pack animals. According to this schedule the first troops would have reached Doriscus on the Hebrus, as the last contingent was leaving the bridge. Thus it would have taken two weeks after the first troops left the Scamander for the whole army to assemble at Doriscus. Herodotus' report on the method of numbering the army when it reached Doriscus is generally thought to be one of the silly stories he accepted without question. However Maurice points out that the march from Aenas at point 6 to Doriscus at 7 was a short one in open well-watered country, where each column as it arrived on open ground between the Hebrus and Lake Stentoris would bivouac and then move further up the valley to make room for the next column coming up behind. This would

[111] See Appendix 2 for comment on what Herodotus meant by "under the lash"

explain Herodotus' story of the numbering in an enclosure.[112]

The size of the Persian army

Maurice explains how he arrived at the size of the Persian army by calculating the flow of the Scamander using a formula (which he does not disclose) "commonly used in military reconnaissance".[113] By this method he estimated a total of about one hundred and fifty thousand combatants and sixty thousand non-combatants and seventy-five thousand pack animals. He broke this down into ten thousand five hundred cavalry, one hundred and twenty thousand infantry, ten thousand "Immortals" and ten thousand in Xerxes' personal escort and "G.H.Q. troops". This can be checked another way which he does not mention. Maurice had walked the full length of the route and established that except where it crossed the R. Melas it was almost all in narrow valleys where only two men could march abreast with the supply column parallel to them. The distance from the Scamander to the Hebrus is 220 kilometres and according to his marching programme, would be completely occupied when the head of the column reached the Hebrus. Marching along a rough track each pair of men would be about 2 metres apart. Therefore the total number of combatants plus non-combatant transport personnel would be approximately (220x1000x2)/2 which is two hundred and twenty thousand, a figure comparing very well with Maurice's estimate of two hundred and ten thousand. If that number crossed the Hellespont, only about one hundred and seventy five thousand actually reached Attica. Gabriel and Metz point out that an ancient army on the march was a "medical disaster" with losses in excess of 20% due to exhaustion and routine injuries, together with a steady decline in resistance to disease.[114] The navy too would have suffered

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[112] Herodt.7.59.

[113] Maurice: 221. His words are:- *The Scamander was the last large source of water supply available for the army before the Hebrus was reached, and by use of a formula, commonly used for military reconnaissance to estimate the water supply, which gives sufficiently accurate results for practical purposes, I calculated that the flow of the river in October 1922 was in its lower reaches at the rate approximately of 50 000 gallons an hour.* In his day the "formula" might have been a military secret.

[114] Gabriel & Metz : 1991,108.

similar losses, a fact of military life so common-place as not requiring comment.

Marching discipline

There are other aspects of armies marching in long columns which present logistical problems. Consider the ten thousand "Immortals" marching on a rough track two by two. As mentioned previously, each pair will be about 2 metres apart so that the five thousand pairs of the column will stretch a distance of ten kilometres! How were orders passed down the column? In another study of military logistics Engels points out that when a column is given the order to march, there is a slight hesitation before the second file moves and then the third, and so on.[115] If that slight pause is only one second, the last file of the five thousand will start marching one hour and twenty two minutes after the order is given! We see this phenomenon today how a row of cars starts moving when the lights change to green. It is clear that a strict march discipline was essential in getting the army of one hundred and fifty thousand men, split into seven sections to move according to plan. This possibly explains the use of whips.

Beaching and mooring the fleet overnight

When the army arrived at Doriscus, the supply problems did not end there. Most, but not all, of the beaches on the rocky coast of Thrace were small ones, which meant that the huge Persian fleet could not be beached at the same place for the night. Herodotus says that at the beach between Casthanaea and the Sepiad headland the warships were anchored off shore in lines eight deep with their bows pointing out to sea.[116] This method of "Mediterranean mooring" with ships up to eight rows deep (*prokrassai*) maximises the number of ships which can be moored in a small harbour or off a restricted beach, was well-known. It requires the innermost row of ships to be beached stern-first. This was necessary because the triremes' rams were below the water-line in front of the bows of the ships. If they came ashore bows-first, the rams dug into the beach which prevented them

[115] Engels: 1978,154.
[116] Herodt. 7.188.1.

being hauled ashore. The ships unable to find a space on the beach were moored with their sterns towards the shore, with their mooring-lines secured to the bows of the ships left and right of them in the next row nearer the shore. Their bow anchors were streamed seawards to hold the ships bows-on to the sea. This process was repeated so that each row contained one ship less than the next shoreward row. The ships had to be moored close enough to each other for their boarding-ladders to be laid from ship to ship, stern to bow, so that the crews could get ashore. (See drawing of the arrangement on opposite page). By using this method a fleet of 132 ships could be moored off a beach only 300 metres long, which would otherwise have room for only twenty, hauled ashore fifteen metres apart. This mooring arrangement means that (in this theoretical example) food, water, firewood and shelter had to be available for more than twenty-six thousand men. Allowing ten square metres of beach per man, for bivouac space, supplies, fires and so on, the crews would occupy an area 300 metres along the beach and about 900 metres inland from it. Each of the crews would have had to bivouac together, with those of the outermost ships nearest to the shore. This arrangement needed skilful seamanship and strict discipline both afloat and ashore. The next morning, the crews of the outermost row of triremes would have been the first to go aboard by scrambling from ship to ship of the inner rows, followed by the crews of the next outermost row, and so on, in order that the fleet could get to sea as quickly as possible, already in formation, without confusion or a clash of oars.

It would seem that the Persians deliberately did not use the full length of the beach on the occasion mentioned by Herodotus in order to make a disciplined fleet manoeuvre the next morning.[117] The gale which unexpectedly blew up overnight, drove a large part of the moored fleet ashore with disastrous consequences.

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[117] Bowen A. *The Place that Beached a Thousand* Ships. The Classical Quarterly. 48. 1998. 354.

Supplies beyond the last food dump

Artabanus' warning to Xerxes that the further one went away from home, the more an enemy the land became, was fully justified. Despite Xerxes' optimism, the Persians knew very well that Greece was "the handmaid of want" and it would not be possible for the army to live off the land. The supply of grain and fodder from ships sailing down the coast had to operate effectively as the army marched the 400 kilometres or so beyond the last food dump, adding its requirements to those of the fleet moving down the coast parallel to it. The task of supplying both the army of about one hundred and fifty thousand as it marched through Greece into Attica, and the fleet with much the same number of crewmen, with a combined daily need of some 370 tons of grain which had to come from the accompanying supply ships, must have strained the commissariat to the limit. The battles of Thermopylae and Artemisium were unexpected three-day delays. What is more, Xerxes gave the sailors three days to view the battlefield at Thermopylae, which, whilst resting them, meant more unplanned consumption of supplies. There was another unexpected hold-up for the Persian fleet, when sailing down the sheltered waters between Euboeia and the mainland. Surprisingly, they were ignorant of the 35 metre-wide passage of the Euripus half-way down the strait. Two triremes rowing abreast through the passage every five minutes, for twelve daylight hours and then followed by the supply-ships, would have resulted in further delay of at least three more long days for the oarsmen on their rowing benches. This would have imposed more strain on a faltering supply system. Getting supplies of food and fuel not only to the army, but to the crews of the triremes beached overnight along a considerable distance of coastline on both sides of the strait, could have partially failed.

Conditions aboard the warships

The Persian fleet was at sea for some four months from the time it assembled off Cape Sarpedon in Thrace to its arrival at Phaleron. Unlike the army, the navy did not carry tents aboard the warships so that the trireme crews had to improvise overnight shelter ashore, whatever the weather. There must have been a loss of efficiency as illness took its toll. Furthermore,

during the movement of the invading fleet southwards in the three weeks before Salamis, there was little opportunity for the Persians to beach, clean and dry out their ships, last done after its arrival at Doriscus.[118] It was a fact of trireme life that there were no sanitary arrangements in the crowded hulls. The oarsmen performed their bodily functions where they sat. The Greek dramatist Aristophanes, who possibly pulled an oar himself, wrote:- [119]

The orders they get from their captains and yet,
when I was alive, I protest that the knaves
Knew nothing at all, save for rations to call,
And to sing "rhyppapae" as they pulled through the waves.
And bedad to let fly from their sterns in the eye
Of the fellow who tugged at the undermost oar
And a jolly messmate with filth to besmirch.

After a few days at sea, without the normal daily practice of beaching, cleaning and drying out, the Persian triremes must have resembled floating cess-pits. The crews working in unbearable conditions would have been in a sorry state by the time they brought their ships to the shore of the curving seven kilometre-long beach of their planned base at Phaleron. On that beach there had to be sufficient food and water for one hundred and fifty thousand men, and the kindling for thousands of fires to cook their meals during the interval of seven to ten days before the battle of Salamis.[120] What is more, the army now around Athens also had to be supplied, possibly from the same beach. The Persian command could not be blamed if the system buckled under the strain.

Wasted effort

A significant part of the Persian logistical effort was dissipated by the amount of wasteful man and animal power used to maintain the ostentatious and luxurious life-style of the king and his nobles, generals and advisers. The daily erection and dismantling of the king's mobile palace must have seriously slowed down the Persian advance. This is confirmed by Xerxes' retreat to the Hellespont taking about 45 days compared with the approximately 120 marching days from Doriscus to Attica. Herodotus

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[118] Herodt. 7.98.
[119] Aristophanes. *"Frogs",* 1068-1076.

relates that on his retreat from Greece, Xerxes left his gorgeously decorated tent with Mardonius, the general in command of the "army of occupation". Pausanias captured the tent after Plataea and ordered the attendant bakers to make a sumptuous meal which was served on gold tables with gold dishes. The Spartan general then summoned his officers to see what the Persians had brought to Greece to "rob them of their poverty."[121]

Greek logistics

Herodotus makes no mention of the logistical arrangements for the Greek fleet for the simple reason that probably there were none. Trireme crews - the unruly "*nautikos oklos"*- were paid a daily rate and expected to find their own sustenance. Supplies often came from merchants who followed the army or navy, trading for their own benefit.[122] The supply situation of the Greeks must have been just as precarious, if not more so than that of the Persians. There had been only a few weeks in which to stock Salamis with food and water and the island was crowded with some forty thousand trireme oarsmen and deck-crews, the eight thousand Athenian and allied hoplites, and an unknown number of refugees from Athens.[123] However they did have the tactical advantage that everyone spoke the same language compared with the Persian generals transmitting orders to their multilingual and multicultural subordinates of their combined fleet at Phaleron.

Persian morale before Salamis

Herodotus relates, in a probably biased account, that Xerxes and his advisers, who probably had never been involved in a set-piece sea battle, ignored the advice of the maritime Carian queen Artemisia who was commander of a small allied fleet.[124] Despite her warnings, the Persian fleet which had been at sea most of a hot summer's day, was ordered to re-embark in the evening, probably before the crews had had time to find

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[120] Burn:1984, 436. suggests that the battle was fought on September 20th, Maurice. 233. September 23rd, and Strauss: 2004,(xii). about September 25th.
[121] Herodt. 9.82.
[122] See chapter iii in Anderson:1970.
[123] Herodt. 8.41.
[124] Herodt. 9. 83.

water to drink or prepare their meals.[125] Consequently, the fleet was at sea all the night before the battle. A likely contributory factor to the Persian defeat was that after a long spell afloat after Artemisium, the Persian trireme crews went into battle the next day in filthy conditions already tired, cold, certainly thirsty, and probably unfed. Furthermore, the oarsmen, even if free men, were regarded as slaves by their Persian overlords, who had no concern whatever for their welfare or morale. On the other hand the majority of the Greek crews were free citizens. With their backs to the wall, a major part of the Greek crews had nothing left to lose except their freedom, whilst the slave component, if any, might have expected their freedom in the event of victory, a possible precedent for the Athenian use of slave oarsmen at the battle of Arginusae sixty-nine years later.[126]

The Persians lost the battle of Salamis, but they had not lost the war. Herodotus reports that Mardonius being a soldier, advised Xerxes not to take it too much to heart, and go home; after all, what were a few planks and timbers?[127] The loss of tens of thousands of slave oarsmen was, to him, of no account. Indeed it is quite likely that with the enormous man-power of their empire to call on, the Persians regarded the navy campaigning on their behalf, as expendable. Xerxes would have been accompanied by his elite bodyguard and some or all of the "Immortals" on his march back to the Hellespont. As Herodotus says nothing about arrangements to get the army back into Asia, or at least, to occupied Thrace, the argument of silence can perhaps be invoked to assume that apart from those assigned to an army of occupation there was no concern about the fate of the rest. Like the oarsmen at Salamis, they were expendable.

The Persian army still occupied Greece with the exception of the Peloponnese. If the calculations made above are approximately correct there were still sufficient food stocks remaining to continue operating for a few weeks before going into winter quarters. Authorities agree that Xerxes' acceptance of Mardonius' advice to return to Asia was a correct one both

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[125] See appendix 4 for a discussion on the amount of water needed by trireme crews.

[126] Garlan Y. *Slavery in Ancient* Greece. Cornell. 1988.165.

politically and militarily.[128] As he had burned Athens to the ground, he could satisfy his own conscience by returning home having got his revenge for Marathon and the burning of Sardis. Herodotus claims that three hundred thousand men remained in Attica under Mardonius' command.[129] From a logistical point of view, and bearing in mind his original estimate of the size of the Persian army, that figure is much too high. The task of maintaining an army of that size, a number much the same as the total population of peninsular Greece would have been a near impossibility. One estimate of the citizen and slave population of Athens, admittedly nearly a century later, was no more than one hundred and forty-four thousand.[130] It seems much more likely that the Persian commissariat would have had to feed an army of perhaps seventy-five to one hundred thousand through the winter of 480-79.[131] In any case a considerable part of the Persian army had returned to Asia through Greece and Thrace. By retiring into Thessaly for the winter months, Mardonius almost halved the length of his supply line into Greece from the dump at the head of the Thermaic Gulf. As Thessaly was horse-rearing country, there would have been grazing enough to reduce the amount of forage for his cavalry to be transported to him. He was successful in keeping his army in Thessaly fed and fit throughout that winter. In one respect he was fortunate that the defeat and withdrawal of the fleet would have unexpectedly left food stocks which could be taken by his army as it retreated inland. Ten months later he returned to Athens and completely destroyed the city.

Mardonius' supply line into Greece

Mardonius' subsequent retreat after the destruction of Athens was probably motivated not only by the threat of attack from a combined Greek army but also to considerably shorten his extended and vulnerable

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[127] Herodt. 8,100.
[128] Burn: 1984, 470. & Strauss: 2004. 263.
[129] Herodt. 9.32.
[130] Jones: 1989, 76-79.
[131] Scott-Kilvert: 1978,120. His suggestion of Mardonius' 60 000 plus Artabazus' 40 000 and 20 000 Greek renegades seems to be far too many to make logistical sense.

supply route from the Thermaic Gulf (see map). Furthermore, by retreating into Thessaly he could choose a battlefield on which he could use his cavalry. As he advanced again into Attica, the next spring, his supply line lengthened with it. It is not likely that ship-borne supplies could reach his army which was now well inland. Using the suggested maximum of one hundred thousand combatants and the daily human requirements of cereals quoted above, the army would have required about 140 tons of grain a day. Assuming that very little could be obtained locally this tonnage had to be delivered by trains of pack animals from the Thermaic Gulf up to two weeks' journey away in his rear, at the rate of travel of pack animals. If the average pack animal could carry 200 kilograms, then the daily arrival of long supply trains amounting to some seven hundred animals would have been needed. Such numbers would soon use up grazing around the army's camps. It must also be borne in mind that the unloaded beasts had to return to the base on the Thermaic Gulf. Congestion on the narrow tracks would have impeded the convoys moving in opposite directions. Thus, it can be seen that keeping Mardonius supplied through the winter was a massive and successful logistical effort, despite interference from guerrillas en route. Keeping the army healthy was another problem. Bearing in mind the primitive hygienic arrangements of the time, an encampment housing about one hundred thousand men and twenty thousand animals would have been as unbearable as the interior of a trireme after a few days' occupation. Mardonius probably took into account a substantial attrition of his forces by disease during their months in winter quarters.

Greek logistics before Plataea

By the time Mardonius had marched southwards to face the Greek forces at Plataea, his much-lengthened supply-line would have become increasingly unreliable. The Persian base at Phaleron had been reoccupied by the Greeks and the short supply route from the coast denied him. However, the oncoming Greeks could have been in no better shape. The Spartan army was the only full-time, "professional" force in Greece, and the

only one which had a properly organised supply train.[132] Their allies' forces consisted of hoplites who were part-time gentleman soldiers who, when called up, took slaves with them to carry their armour and three, five, or seven days' supply of food, depending on circumstances.[133] When those supplies were exhausted they had to rely on merchants who either accompanied the march of the army, or followed soon after.[134] To complicate matters, the soldiers had to be regularly paid so that they could buy supplies from the merchants who accompanied the army. In his assessment of the battle, Burn speculates just how little the Greeks had left to eat.[135]

In view of the logistical difficulties for both sides, it is remarkable that the opposing armies delayed so long before engaging. Herodotus relates how Mardonius sent his cavalry into a pass over Cithaeron where they destroyed and captured a Spartan train of 500 mules carrying supplies.[136] The survivors were driven back to the Persian lines where the contents were probably as badly needed by the Persians as they were by the Greeks. The battle of Plataea has a strong parallel with the fleet action at Salamis. The army had already passed two winters away from home and a third one was approaching. Their supply situation was precarious and confronted by an unexpectedly large coalition of Greek forces, their morale must have been affected.[137] Similarly, as Artemesia objected to Persian strategy before Salamis, the nobleman Artabasus disapproved of Mardonius' plans and a Persian defeat was assured when, on the death of his superior officer, Artabasus quit the battlefield with his considerable force.[138]

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[132] Xenophon. *Lacedaemonion Politeia*.11.2. See also Anderson: 1970. 45.
[133] Xenophon. *Hellenica* 7.1.41
[134] Anderson: 1970, 53.
[135] Burn: 1984, 531.
[136] Herodt. 9.41.
[137] Burn: 1984, 528.
[138] Herodt. 9.67.

Conclusion

The Persians were the rulers of an empire which was enormous by the standards of the time, with immense monetary and human resources. With these went a remarkable confidence in their ability to overcome physical obstacles, by excavating a canal of a size which would give pause to modern civil engineers. They threw not one bridge but two across a major water barrier, and supplied their army with huge tonnages of food from distant sources. One gets the impression that the army and navy were regarded as expendable in a venture mounted without any thought of profit, only a desire for revenge. A comparable modern equivalent would be the immense deployment of American resources in a national effort to put a man on the moon before the Russians could do it.

The Persians came close to succeeding, with an incredibly difficult logistical exercise, planned over at least four years. Their timetable was disrupted by the bridge of boats being broken in a storm. They were then held up for three days by Leonidas at Thermopylae, and unwisely allowed the loss of another three days for viewing the battlefield. Their advance into Greece was slowed by the daily erection and dismantling of the king's luxurious tent. The fleet sustained heavy losses by storm off Euboea and then delayed by ignorance of the narrows of the Euripus which checked their move south. The sum of these setbacks meant that the Persians arrived at their objective later in the season than intended.

The sending into battle of a tired, hungry and thirsty fleet contrary to an expert's advice led to Xerxes' defeat at Salamis. This resulted in the best of the Persian army having to spend the following winter in Thessaly at the end of a faltering overland supply line. Mardonius' return to Athens the next spring to completely destroy the city did nothing to improve his supply situation but only succeeded in uniting the Greeks and strengthening their resolve to resist and then defeat their enemy at Plataea.

Both Xerxes and Mardonius rejected sound advice which contributed to their respective sea and land defeats, thus effectively ending Persian military ambitions in Europe. Another important component in their defeats was the probable failure, partial or perhaps sometimes total,

of an extraordinarily complex food supply chain. It was designed to support an overwhelming force rather than sufficient man-power to defeat a smaller army and navy of temporarily united opponents. As the army marched into Greece, away from its major forward food dump in Macedonia, the extended overland supply route became uncertain, particularly for Mardonius' army in Thessaly during the winter months. As the navy moved in parallel to the army down the passage of the Euripus towards Phaleron, it had to rely on sea-borne supplies shipped to a coast with insufficient beach space to accommodate the hundreds of warships whose crews were increasingly unable to come ashore to be regularly fed and rested. Consequently they became progressively less fit and ready to fight the battle of Salamis, whilst a similar logistical situation the following summer contributed to Mardonius' defeat at Plataea.

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CHAPTER TWO.

COLONISING AMPHIPOLIS: The real cost of ship-timber.

The thin soil of the narrow valleys of Greece or Ionia did not allow for the support of growing populations, and from the ninth century onwards there was a wide-ranging diaspora of emigrants looking for places to settle from the western Mediterranean to the Black Sea littorals. This resulted in the founding of scores of colonies and, in doing so, generated in the Greek psyche an ability to sail away and find a new home whenever physical or political circumstances demanded it. For example, Herodotus relates an extreme case when, the night before Salamis, Themistocles threatened that the Athenians would found a new colony in Italy if their fellow-Greeks would not stay and fight.[139] There was a precedent still in memory, as in 540 the Phokaeans had fled their city in pentekonters when threatened by the Persians.[140]

The Sources

Thucydides took a great interest in the relationships between mother cities and colonies. For example some of his most powerful writing is concerned with the relations between Corinth, the mother city, Corcyra, the daughter colony and Epidamnus a colony of Corcyra, yet he reports with little comment on the colonisation of Amphipolis and its subsequent destruction. He gives the impression that the colony was established by "civilians" and does not mention whether an *oikist* or colony leader was appointed.[141] Thucydides dismisses this Athenian disaster in two sentences.[142]

About the same time they sent out to the River Strymon ten thousand colonists from their own citizens and from allied states to settle the place...now known as Amphipolis. They occupied (it) driving out the Edonians who held the place, but when they advanced farther into the interior of Thrace, their force was cut to pieces at the Edonian town of Drabascus...

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[139] Herodt. 8. 62.
[140] Herodt. 1.165. (But some were homesick and returned!)
[141] Graham A.J. *Colony and Mother City in* Ancient *Greece*. Manchester.1964. 9-12
[142] Thuc. 1.100.2.

This terse account of aggressive imperialism leaves the reader wondering what is unwritten and unknown about this venture which ended with the loss of ten thousand lives. Despite this setback for Athens it was successfully recolonised by Hagnon in 437-6.[143] Athens lost control of the place once and for all to the Spartan Brasidas in 424 thanks to the inability of Thucydides to arrive in time to defend it.

Plutarch throws a rather different light on the matter.[144] He says in *"Cimon":-*

After the Medes were driven from Greece, Cimon was sent out as one of the commanders of the Greek expeditionary force.....Now that the allies had come over to his side, Cimon assumed command and sailed for Thrace. He began by defeating the Persians...who were holding the city of Eion on the banks of the Strymon...drove the Thracian tribes out of their territory (and) captured the city.

Cimon's capture of Eion

In 476-5, three years after the expulsion of the Persians from Greece, the Athenians took their first steps towards becoming the leading state in the Aegean basin. Attica had already been largely denuded of its forests and Athens had a great need for a reliable source of ship timber. At least twenty new triremes were needed each year to replace the oldest vessels as they were phased out and thus maintain her fleet strength of 200 ships. The difficulty in acquiring ship timber seems to have been a constant concern for the Athenians. It even surfaced in the theatre. The dramatist Euripides, who lived from 480 almost to the end of the Peloponnesian War has the old nurse say in the opening lines of the *Medea*:-[145]

.....If that pine on Pelion's slopes
Had never felt the axe, and fallen, to put oars
Into those heroes' hands, who went at Pelias' bidding
To fetch the golden fleece!....

The straight-grained pine (*peuke)* for oars was cut from forests two

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[143] Thuc. 4.102.3.
[144] *Cimon* 6.
[145] Euripides. *Medea & Other Plays* tr P.Vellacott.Penguin.1988. *Medea* 3-6.

hundred kilometres distant from Athens in the rugged country of north-eastern Thessaly. Athenian awareness of the prolific sources of timber in Macedonia could have dated from the mid-sixth century when the tyrant Peisistratus would have taken note of it when exiled to that region. During the seventy years from 480 to 410 Athens maintained a fleet of at least 200 triremes which had a useful life of about 20 years. Replacing about 20 per year meant that 1400 warships had to be built and two hundred and eighty thousand oars made to propel them. For optimum strength each oar was made from one tree.

Macedonian resources were controlled by the king who gave gifts of timber as he pleased. For example, in 423 Perdiccas II agreed to sell oars to Athens only. In 480 Alexander of Macedon was honoured as *proxenos* and *euergetes* by Athens in recognition of his timber grants to the fleet building programme of Themistocles.[146]

It would seem that Cimon set out to do something about the supply of ship timber. Political instability in Macedon following the death of Alexander provided the opportunity for Athenian occupation of the valley of the lower Strymon.[147] Reading the two accounts of the capture of Eion together, Thucydides' words "about the same time" could mean "after Cimon had captured the place....." This suggests that in order to ensure their possession, and to release Cimon's army for service elsewhere, the Athenians almost immediately "sent out" ten thousand settlers to occupy what they perceived as a militarily and economically important site on a ford over the Strymon. This was known as Ennea Hodoi or "Nine Ways", which they renamed Amphipolis as the site was within a defendable loop of the Strymon. Thucydides relates, but Plutarch does not, that the Thracians united in alarm and in the following year they defeated the Athenians at Drabescus and wiped out their colony.[148]

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[146] Borza E.N. *Timber and Politics in the Ancient World: Macedon and the Greeks.* Proceedings of the American Philosophical Society. Vol 131.1987.41.
[147] Borza: 43.
[148] Hammond: 1989, 290.

The valley of the Strymon is the most fertile in the northern Aegean area.[149] Not only was the region a valuable source of ship timber, but the near-by silver mines of Mount Pangeum were an added attraction, and Athens was not alone in coveting it. Although the Persians had been driven out (or perhaps "retired from") Greece in 479 they still had a strong grip on the fortress towns of Eion on the Strymon and Doriscus, both of which had been important food dumps in their attempted conquest of Greece. In reviewing the history of this colony there are many questions which come to mind about the logistics of the original venture of 476 and to fill out the bare facts reported by Thucydides and Plutarch.

At the time of Cimon's expedition, the Greeks were still at war with Persia. The decision to "colonise" the area should have been taken by the Assembly after his capture of Eion. It seems more likely that advantage was taken of Cimon's opportunistic military occupation of the area. Although Plutarch says that Cimon "handed over this land to the Athenians" it would seem that it was a token gesture and the religious and procedural activities required to found a colony were dispensed with.[150] Two other colonies, Brea and Thurii were established in the fifth century and both were founded in the traditional manner. As Cimon's army was needed elsewhere the decision was taken to fill the place with "colonists" who would occupy the river crossing at Amphipolis. Some Athenians such as Thucydides' family would have been familiar with the territory, and indeed drew their wealth from it, but most would have had little knowledge of the place which had been under Persian control for the previous sixteen years.

The unusual first colonisation of Amphipolis

Thucydides tells us that Athens "sent out" ten thousand colonists "of their own citizens" and from "allied states" as settlers.[151] The two words "sent out" raise many questions. Thucydides' contemporary audience would have been well aware of the procedures involved in the permanent relocation of large numbers of citizens. This question does not seem to have

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[149] Casson: 1926, 6.
[150] Plutarch. *Cimon.* 8.
[151] Thuc. 4.102.2.

exercised the minds of modern historians and the interested student can only speculate how it was done.

The formation of a colony generally required the appointment of an *oikist* who consulted the Delphic oracle and performed religious duties as the colony leader.[152] There would have also been a "foundation decree" which is not mentioned by either historian.[153] We do not know who the *oikist* was after Cimon withdrew his army. There was generally a sentimental and religious connection between mother city and colony, but this connection seems to have been absent between Athens and Amphipolis. For one thing a large proportion of the colonists were not Athenians having been recruited from nearby settlements. It is therefore suggested that to call the first occupation of Amphipolis a "colony" in the long-established Greek sense is incorrect. It was no more than an enclave established for imperial and logistical reasons by opportunistic military conquest, rather than deliberate, peaceful, resettlement of excess population.

Why the firm number of ten thousand colonists? Aristotle gives a clue in his *Politics* where he quotes the opinion of the Milesian town-planner Hippodamus (who laid out the Piraeus) that the ideal city contained ten thousand citizens composed of artisans, husbandmen and soldiers in equal proportions.[154] Wives, children and slaves were not considered. It is interesting to note that Xenophon thought that his "Ten Thousand" could found a city on the Black Sea coast and presumably find wives and slaves locally.[155] As Hippodamus flourished early in the Pentecontaetea his views would have been well-known and perhaps influential in the decision to send the specific number of ten thousand citizens to colonise Amphipolis.[156] This might suggest that the correct religious and political steps were taken to form a colony, but Thucydides does not mention the appointment of an *oikist.* Perhaps Cimon as the local army commander was appointed whilst his army was in the area.

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[152] Graham: 1964, 27.
[153] Graham: 1964, chapter 4.
[154] Aristotle: "*Politics*" 1367b 30
[155] Xenophon: *Anabasis 5*.6.15.
[156] "Hippodamus" *Oxford Classical Dictionary:* 519.

For the purposes of this argument, it is assumed that the personnel selected according to the recommendation of Hippodamus, were *thetes,* the humblest class of citizens, and *zeugitae*, the lowest class which could bear arms. There is no mention of a military commander after Cimon had left. The military component perhaps consisted of *zeugitae* trained as peltasts, rather than hoplites which Athens could ill spare. It is tempting to think that the "citizens from allied states" were Athenian citizens from cleruchies, but none existed in the first half of the fifth century. As a matter of convenience in moving in "colonists" as quickly as possible, they would probably have come from the nearby islands and allied settlements in Thrace, a recruitment possibly facilitated by agencies within the Delian League.

The Athenians would perhaps have not separated free men from their families permanently, so it is likely that many of the colonists would have been young and single volunteers. They probably would have been expected to find wives and slaves for themselves from the local population of Edonians. The Edonians incidentally, had been deported to Mesopotamia by the Persian general Mardonius about 492 and brought home again by Aristagoras of Miletus.[157] They were probably in no mood to be displaced again, this time by Athenian intruders. Plutarch is probably correct in saying that Cimon led his own army rather than "colonists" in capturing Eion, which he did after a long siege, and whilst there, recognised the strategic value of the site of Amphipolis.[158]

Transferring the colonists

The transferring to Amphipolis of ten thousand men, a small proportion of whom were Athenians and mostly "volunteers from other places" would have been a difficult task requiring prudent planning. Presumably the Athenians were from the lower social classes, hoping to find a better life overseas. In order that the colony survive any aggression on the part of the local inhabitants, careful coordination was essential so that all the participants arrived in one sailing season and whilst Cimon's army was

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[157] Casson : 1926.179. & Thuc. 4.102.
[158] *Cimon.* 7.

still in occupation of nearby Eion. It is possible that the Athenian contingent could have marched overland through friendly Thessaly, but it is more likely that it was transported in merchant ships or in "trooper" triremes which could hold about 150-170 men including the oarsmen who would have come from the thetes class and could have been potential colonists themselves. In that case a decision would have had to be made whether the slow and clumsy troopers made the longer coast-wise passage or risked a shorter open sea voyage which would have been more or less to windward requiring more rowing than sailing. On arrival, the trooper triremes could then have been used by Cimon to help transport his army to his next assignment which was the reduction of Dolopian pirates on the island of Skyros. The local "allies" would have had very much shorter sea passages and could also have travelled overland. Presumably before withdrawing his army, Cimon would have organised the early arrivals, seeing to the defences, building of houses, planting of crops and so on. The difficulty of transporting men over some 500 kilometres from Athens, compared with the considerably shorter journeys from islands or settlements much closer to Amphipolis, would suggest that there was a relatively small proportion of Athenians in the colony.

The newly arrived occupants of Amphipolis would have had support from the recently captured port of Eion nearby, to help them establish the "colony". The food supply problem would have been greatly eased if the Persian granaries in Eion were still fit to be used. The place had been a major Persian food depot only a few years before, and grain ships from the Black Sea ports could deliver cargoes there for the use of the colonists.

Thucydides gives no idea how long after settling in Amphipolis the colonists moved towards the neighbouring Edonian town of Drabascus. The purpose of their advance was possibly to look for suitable stands of timber or for gold or silver mines, or to capture wives and slaves from the local population. If the composition of the colonists was according to Hippodamus' recommendations, then only about a third of the men had military training and certainly not hoplites, but peltasts at best, and

seemingly without competent military leadership. It is hardly surprising that they were outnumbered and cut to pieces by the Edonians. From the evidence, it would seem that Athens gained little or no economic advantage, either in timber or precious metals out of Amphipolis, before Cimon's ten thousand colonists were destroyed.

Hagnon's Colony

In 437 the Athenians made a second attempt to colonise Amphipolis under the distinguished general Hagnon, and it proved successful for its first decade or so as an Athenian strongpoint in Thrace. Thucydides does not mention how many colonists were sent there, Graham suggests it is reasonable to assume that in accordance with custom, there would have been not less than ten thousand.[159] It would seem that this time the prescribed religious and civil procedures were followed and Hagnon was appointed *oikist.* He "drove out" the local Edonians from the area for a second time in their recent experience, built walls around the site of the city in the loop of the Strymon, and bridged the river.

Apart from being a source of timber, precious metals and taxes, Amphipolis had an important strategic value in protecting Athens's allies in the Thraceward region, and it soon became a thriving community. There was however a built-in weakness. At that time, Athens' man-power resources probably amounted to about fifty thousand men, so that the city could not afford to supply more than a token force of colonists.[160] As a result, most of the colonists were recruited from the settlement of Argilus, only a few tens of kilometres away, which itself was a colony of Andros.[161] An unfortunate consequence was that most of the new population of Amphipolis had little or no loyalty or attachment to Athens, and the surrounding Edonians had no love at all for their neighbours. It might have been considered that there were sufficient Athenians in the nearby port of Eion, who manned the fleet stationed there, to discourage any attacks on the town, but events proved otherwise.

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[159] Graham: 1964, 37. n6.
[160] Meiggs: 1987,196
[161] Thuc. 4.103.

Building triremes on the Strymon

During the thirteen years of its existence as an Athenian colony, Amphipolis must have supplied sufficient ship timber to justify its continued occupation. We have no idea how it was organised and can only speculate whether uncut timber was shipped to Athens, or, what was much more likely, triremes were built on the banks of the Strymon and then sailed to Athens or wherever they were needed. It can be inferred that Hagnon had an economic strategy by including amongst his colonists a proportion who were skilled shipwrights. Thucydides reports that thirteen years later, the Spartan general Brasidas, who certainly had no maritime experience, but was obviously well informed about local ship-building skills, arranged to have triremes built at Amphipolis whilst he occupied the place.[162] Without reading too much into one sentence of Thucydides, it can be inferred that local ship-building yards were operating. It would have been a logical and minimum cost solution to build triremes on the spot rather than send uncut ship-timber to distant ship-yards. Furthermore, ship-building was a year-round activity, but shipping uncut timber was possible only in the sailing season. This raises the interesting question whether master shipwrights had building plans on papyrus as the warships were of a very similar design wherever they were built. On the other hand young men could have learned the trade as "apprentices" before being considered as potential colonists.

The building of triremes on the Strymon instead of shipping timber was one thing, but delivering the warships to wherever they were needed, was another. Each ship required 170 oarsmen plus ten deckhands and ten officers for delivery voyages to Athenian naval bases in the Aegean. It would have been a good opportunity for a trierarch to mould his crew into a fighting unit during the voyage. That meant choosing crews and getting them to Amphipolis. If one reads "The Old Oligarch" a little loosely, it can be inferred that most Aegean Greeks, whatever their social status or

wherever they lived, had at some time experienced life on the rowing benches.[163] This being so, it is also possible that Amphipolitan crews delivered the newly-built ships. Either way, this solution was a far better one than shipping uncut timber by cargo boat to shipyards throughout the Aegean and using it to build ships in an area where transport costs would have to be added to the much higher construction costs in allied shipyards. This scenario is of course speculative. As far as one can tell, no remains of ship-sheds like those uncovered in the Piraeus have been found in the neighbourhood of Amphipolis or Eion.

Brasidas' capture of Amphipolis

The capture of Amphipolis by the Spartan general Brasidas in 424 was a serious blow to the Athenian war-effort at a time when she had the upper hand as a result of the capture of Pylos. Thucydides splits his account of Brasidas' feat into two parts, the first describing his rapid march from the neighbourhood of Corinth to Acanthus and, in the second part his capture of Amphipolis.[164] Brasidas had a small army of seven hundred hoplites and a thousand mercenaries. It would seem that he had been given a free hand to use these troops as he wished. There was deep concern in Sparta that their helots might revolt, in view of the Athenian killing or capture of four hundred and twenty Spartiates on Sphacteria.[165] Getting Brasidas' army, with its thousand potential revolutionaries, out of the country was a wise precaution. If Brasidas could embarrass the Athenians in the process, then it was so much the better. It has been noted above that the Spartans were the only Greeks to have an organised commissary and Brasidas probably had a supply train in addition to his small army. Thucydides does not say how long Brasidas took to cover approximately five hundred kilometres into Thrace. Marching hard and fast it would have taken 14 to 16 days. As he marched in the autumn it might have been possible to "live off the land" to a limited extent as the harvest would have been gathered in. As Thucydides goes into some detail about it, he must have regarded

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[162] Thuc. 4.108.
[163] Xenophon. *Athenaion Politaia*. 2.
[164] Thuc. 4.78. and 4.102-107.

Brasidas' march as a remarkable achievement which modern historians seem to pass over without comment.[166] His march was so rapid that he did not give possible Thessalian opposition the time to concentrate their forces and confront him. Marching non-stop, he covered the approximately thirty-five kilometres from Meliteia on the frontier with Achaia to Pharsalos (almost half-way across the Plain of Thessaly) in one day.[167] He also remarks on the Spartan general's upright and moderate conduct, which reputation proved invaluable later in the war when Spartan propaganda gave Athenian allies the impression that all Spartans were like him. He used conciliatory language in times when terror tactics were usual. His capture of Acanthus by suggesting that he might destroy their fruit crop was masterly.

Brasidas' enterprising capture of Amphipolis after a day and night march from Arnae in Chalcidice, resulted in the capture of the bridge over the Strymon. Campaigning was supposed to be suspended for the winter and the Amphipolitan guards were relaxed. He was greatly helped by the anti-Athenian sentiments of most of the Argilian inhabitants of Amphipolis, who betrayed the place to him. Eucles, the Athenian commander in Amphipolis, had only a small force of doubtful loyalty and was helpless. Thucydides arrived late on the scene with his fleet of seven triremes and had no option but to watch Brasidas take Amphipolis, and use his small force to defend Eion. As will be discussed below, triremes in support of land forces were highly inefficient. If Thucydides had been able to put ashore at Eion seven ship-loads of two hundred soldiers each, or even oarsmen trained to fight as peltasts, he might have been able to threaten Brasidas' little army. In the event, attempts by Brasidas to capture Eion were frustrated by the lack of Spartan support thanks to their preoccupation with the Pylos problem.

These events occurred towards the end of the Archidamian war. In 422 the ambitious politician Cleon, who had shown surprising ability at Pylos, was sent to recapture Amphipolis. He was easily out-generalled by Brasidas

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[165] Thuc. 4.38.5.
[166] A review of Internet search engines such as JSTOR proved fruitless.

but both were killed during the Spartan defence of the town. Amphipolis was supposed to have been returned to Athens under the terms of the Peace of Nicias in 421, but nothing happened and it remained in Spartan hands. The Athenians did not make any more serious attempts to recover this very important outpost in the Thraceward region despite its economic potential and strategic situation.

After the disaster at Syracuse, Athens had to rebuild her fleet by every possible means, both through the resources of the state and private endeavour. With Amphipolis in hostile hands and Magna Graecia and Sicily forever out of reach, there was no alternative but to turn to Macedon. Fortunately for Athens, the unreliable king Perdiccas had died, and was succeeded by the pro-Athenian Archelaus who by using his royal prerogatives provided Athens with timber without compromising Macedonian neutrality, for the remainder of the Peloponnesian War.[168]

The balance sheet

Athens held Amphipolis for two periods together amounting to some fourteen or fifteen years between 476 and 422. During that time ten thousand settlers of the first occupation were wiped out at Drabascus. The second time it was lost, the Athenian component of Hagnon's occupation force moved to Eion with few casualties. The ship-timber and ship-building potential of the place which was denied them had a serious effect on the replacement of ageing Athenian battleships. There is no record of the amount of silver and gold which was produced during that period, but even if it was small its loss would have been felt in Athens when funds were badly needed for the prosecution of the war. Just as important was the loss of an important strategic centre in the Thraceward region, and an increase in Spartan influence in that area.

Conclusion

Amphipolis was not originally colonised in the accepted sense, but as the result of an opportunistic seizure of territory by Cimon. Athens

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[167] Thuc. 4.78.5. The straight-line distance was measured from a modern large-scale map and compared with a classical map.
[168] Borza: 44-45

probably lost the place the first time due to an attempt to expand the settlement with poorly led, lightly armed, and outnumbered troops after the departure of Cimon and his army. The second colony was founded on traditional lines, but a large proportion of the colonists had no Athenian connections or sentiment, and surrendered the town to the Spartan Brasidas as soon as opportunity offered. Athens thus lost an important source of ship-timber as such, or, what was much more likely, a valuable supplier of fully built triremes, and thus suffered a tactical and strategic blow. After Cleon's ill-fated expedition, and an unsuccessful collaboration with the Macedonian, Perdiccas failed in 413, Athens made no further attempts to recover the place.[169] The price to be paid for Amphipolitan ship-timber was far too high. It was far less trouble to honour the Macedonian kings as *proxenoi and euergetes* as had been done before, and repeated again for Archelaus in 407/6.

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[169] Thuc. 7.9.

CHAPTER THREE.

THE SICILIAN EXPEDITION : The logistics of hubris and hunger.

Introduction

Before discussing the logistical implications of the Sicilian Expedition it is of interest to get some idea of how, after they had expelled the Persians from Greece, the Athenians, contrary to their historical experience, developed an ability to mount naval and military expeditions over considerable distances at short notice. Athens had been completely destroyed in 480, and her inhabitants dispersed to places of safety, and yet as soon as the city had been repopulated and its walls had been rebuilt the instinct for aggression asserted itself.

The Greek *poleis* had traditionally settled their differences by finding a suitable area of level ground convenient to their borders where the opposing spear-wielding hoplites could engage in what amounted to a lethal shoving match whilst their slave servants hurled stones and abuse. As these encounters were very rarely far from home, the campaigns were short ones, taking place in the months between sowing and reaping. The Athenian hoplites who fought at Plataea and in front of Syracuse were "amateur" soldiers, as they had no formal military training before 325.[170] Each hoplite was attended by a slave who carried his master's food supplies, armour and weapons. There was no properly organised supply system and the needs of the combatants were met by civilian merchants who followed the army. In this respect the Spartans were the exception, as every fit man was a full-time soldier who was served in the field by a properly organised supply train manned by helot slaves. The Athenian reliance on civilian suppliers for the army applied equally to the navy as Athens extended her hold over the Aegean communities.

The learning curve: Cimon's long-range naval warfare

Thirty years after the victory of the Hellenes over the Persians, the growing power of the Athenians was causing strained relations between the city and its neighbours. Having made a five year truce with the Spartans,

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[170] "Epheboi" *Oxford Classical Dictionary.* 386.

Athens cast around for an excuse for a war. Being still at war with the Great King, they did not have far to look. Thucydides says that in 450 :-[171]

Having no Hellenic war on their hands, the Athenians, under the command of Cimon, made an expedition against Cyprus with 200 ships of their own and of their allies. Sixty of these were detached to go to Egypt at the request of Amyrtaeus, king of the marshes, with the rest they laid siege to Citium.

Plutarch in his "Life" of Cimon says :-[172]

.....(Cimon) had 200 triremes manned, with the object of making another expedition against Egypt and Cyprus. His plan was to keep the Athenians in constant training through their operations against the barbarians and to allow them to profit from the wealth they took from their natural enemies...after detaching a squadron of sixty ships to proceed to Egypt, he made for Cyprus with the remainder. He defeated the king's fleet....in a sea battle and won over the cities in the neighbourhood.

There was of course more to it than that. The Persians still controlled the rich wheat-lands of the Black Sea littoral and were conducting an economic war on Athens, indeed, on all Greece. They also held wheat-rich Egypt except for the Nile delta, where guerrillas were being supported by Athens. Bearing in mind that open water passages were safest between May and September, it would be expected that the planning of the expedition, assembly of combatants and their shipping would have been made during the winter months. The reading of Thucydides suggests that it was an almost *ad hoc* decision to make war on Cyprus and assist the Egyptian king. Certainly, the planning period must have been very short and the supplying of the combatants left, as was traditional, to the private enterprise of Athenian merchants. Thucydides does not mention how many supply ships accompanied the fleet. It is not likely that the Athenians risked their entire fleet of warships to this bold long-range venture and not all of the troops would have been hoplites. In the thirty years since Salamis those battleships which had survived had rotted away, and improvements in the design of the new vessels allowed for blue-water instead on in-shore operations. Cimon was able to use larger and modified ships to carry a

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[171] Thuc. 1.112.
[172] Plutarch. *Cimon* 18.

"great number" of hoplites in which storage had to be available for armour and weapons. He might have used older ships converted to "trooper" triremes, the oarsmen being trained as peltasts or light infantry of some sort. There was a precedent for this. Herodotus implies that the whole of the manpower of the invading Athenian and Eretrian fleet had marched on Sardis in 498, the oarsmen taking on some sort of military role.[173]

The nearest point on Cyprus is some 900 kilometres from Athens. The first half of the voyage would have been easy "island-hopping" as far as Rhodes, but the second half meant making either a risky open sea passage or coasting down the inhospitable and Persian-held southern coast of Anatolia before heading westwards over about 80 kilometres of open sea to the north coast of Cyprus. It should be noted that Cimon attacked Cition on the more sheltered southern coast of the island, even further away and with a long coastwise voyage to windward back to Athens. It would not have been possible to complete the enterprise within one sailing season which meant that the fleet would have had to over-winter on Cyprus around the captured port of Cition. The early return of the fleet was apparently due to lack of provisions and the death of its commander.[174] It is likely that the Athenian force could not live off the land once the supplies carried with the fleet had run out.

Despite its early conclusion, Cimon's successful naval and infantry assault on a distant enemy coast within a limited "window of opportunity", demonstrated to the increasingly confident Athenians what could be done. Their naval control of the Aegean Sea during the Pentecontaetea, in which time warship design was being improved meant that "blue water" passages of 200-300 kilometres became less risky. Thucydides relates at 3.49, how, in 427, following the Mytilinian Debate, a trireme made a non-stop voyage of 340 kilometres from Piraeus to Mytilene under oar-power only. The circumstances were exceptional, but demonstrated that twenty-three years

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[173] Herodt. 5.100. *The Ionians, having with this armament come to Ephesus, left their ships at Coresus…and themselves marched inland with a great host….they came to Sardis and took it.*
[174] Thuc. 1.112.

after Cimon, the most modern ships available could make long voyages in fair weather. Whether the crews would have been ready for battle after a long voyage was another matter, which was appreciated by the Syracusan leader Hermocrates.[175]

Athens and Sicily

Sicily was well known to the Greeks at large, as the island had been colonised mainly by Corinth, Chalcis, Eretria and Megara, from the late eighth century onwards, and the Corinthian foundation of Syracuse had become an important maritime power. Athens was particularly attached to Ionian Leontini in the east of the island, and Segesta further west. The habitual Greek propensity for internecine strife had been carried with the colonists to Sicily, and Dorian and Ionian colonies were continually at war with one another. The island had become a well-developed source of cereals which were in demand by most of the Greek *poleis,* particularly Athens, which had insufficient agricultural resources to feed its urban populations. The Persians had lost the war of 480-79, but remained in control of the wheat-lands of Egypt and the Black Sea littoral, had a strong influence in Greek affairs. In 427 Athens intervened in hostilities between their ally, Leontini, and Syracuse ostensibly to aid Leontini, but in reality to prevent corn being sent to the Peloponnese and at the same time to establish whether it was possible to gain control of the island and its extensive wheat-growing capabilities.[176] Pericles' warning that Athens should not attempt imperial conquest whilst at war with Sparta was quite forgotten.[177] This expedition was a relatively small one of twenty ships, sufficient to gain experience in sailing without interference along the hostile western coast of the Peloponnese. The Athenians would have relied on their allies and friendly cities to supply them whilst in Sicily, but some form of supply ship must have been part of the fleet which sailed from Athens for a visit which extended into the following year.[178] Those Athenians who

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[175] Thuc. 6. 34.5.
[176] Thuc. 3. 86.4.
[177] Thuc. 1.144.1.
[178] Thuc. 3. 88.

entertained thoughts of conquest in Sicily would have gained a good idea of the logistical problems involved in transporting and supplying an army for some one thousand four hundred kilometres entirely by sea, a voyage which required coasting along mainly hostile shores. The two reconnaissance expeditions lasted into the following years so that, like Cimon's Cyprus venture, the hoplites were away from home for an extended period and the first signs of a full-time force appeared in a Greek army apart from that of the Spartans.[179] Nevertheless, the returning commanders were punished for not having subdued the island![180]

The Sicilian Expedition

For long periods during the Peloponnesian War, her sea-power gave Athens an advantage over the land-bound power of Sparta. Confidence grew to the point where, with experience gained from the expeditions of 427 and 424, the ambitious Alcibiades was able to convince his fellow citizens that they could mount a successful sea-borne attack on Syracuse, which, being a colony of Corinth was Dorian and hence a natural enemy. The Persian defeat at Salamis was almost seven decades in the past, and the lessons which should have been learned from the consequences of long-range military adventures were unheeded by the brilliant, but flawed politician. The experienced Athenian general Nicias, who was known for his cautious competence, like the Persian Artabanus before him, pointed out the logistical difficulties of long-range warfare. He was outvoted and unlike the Persian, obliged to share in the command of a venture totally different from the short-term campaigns on which his reputation was gained. Nicias also had other irons in the fire. He was in fact the Syracusan *proxenos* and having connections in that city and being well-informed about its affairs, sought political advantage rather than a military solution.[181]

It is not intended to discuss the Sicilian expedition in detail, but to highlight the effects of *ad hoc* planning of the expedition by three generals

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[179] Hornblower: 1983,157.
[180] Thuc. 4.65.4.
[181] Green P. *Armada from Athens*. Hodder & Stoughton. London. 1971. 4.

each with a different agenda. It is remarkable how quickly the Athenians mounted the expedition once Alcibiades had convinced the people that they could capture Syracuse, a city the size of Athens, and some one thousand four hundred kilometres of coastwise sailing distant . It must be a measure of their self-confidence that after a very short period of planning and preparation, they sailed in August with the sailing season already half over.[182]

There was no question of the fleet "living off the land", because the coasts of the Peloponnese as far as Cephallenia, although not heavily populated, were hostile. They later found that they were not welcome along the Italian coasts of Magna Graecia, indeed Tarentum and Locri even refused both anchorage and water, which must have caused considerable difficulties. Nevertheless, the Athenians were able to store ready-cut ship-timber at Caulonia not far from Locri, which was later denied them by the Syracusans who burnt it.[183] The supply ships had been instructed in advance to gather at Corcyra to await the arrival of the fleet, presumably to avoid any delay due to their slower sailing speed, and ensure that their cargoes were immediately available. Presumably they must have sailed from Athens some time in advance of the warships. Thucydides says that there were thirty supply ships which accommodated bakers as well as other craftsmen from which it can be inferred that they carried grain.[184] There was in addition a large fleet of small ships, some of which accompanied the fleet for the purpose of trade in a manner analogous to the merchants who followed Greek armies. This method of informal supply was also used by the Syracusans.[185] During one of the last battles in the Great Harbour, the Syracusan authorities ordered the market vendors to move their stalls down to the waterfront so that the trireme crews could come ashore, buy their food and take their dinners close to their ships, and then continue the battle. The Athenians were unprepared for the

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[182] Thuc. 6. 30.
[183] Thuc. 7. 25.2.
[184] Thuc. 6. 44.1.
[185] Thuc. 7. 40.2-4.

renewed attack, and were defeated in an extraordinary precursor of Aigospotami.

By the end of the fifth century merchant ships could carry at least 100 tons of cargo so that the fleet could have taken some three thousand tons of grain with it, plus additional amounts shipped by the accompanying merchants.[186] Thucydides says that at least one of the Athenian merchant ships was of 250 tons capacity.[187] This suggests that the invaders could have carried with them considerably more than three thousand tons of grain. Bearing in mind that Athens imported Black Sea grain to feed its population, such a large tonnage could have only been immediately available to supply the expedition from stocks in the commercial granaries in the Piraeus. In view of the short time between the decision to go to Syracuse and carrying out the plan, cargoes arriving from the Black Sea also might have been immediately re-routed to Corcyra. Alcibiades recognised the need to make friends with the native Sicels and Siciliot cities in order that they might supply grain to the invaders.[188] There must have been a considerable lapse of time between the arrival of the first and last supply ships at Rhegium, which was the assembly point before crossing the strait to Sicily.

Going ashore to eat and rest

In the seven decades since Salamis, Athenian experience during the Pentecontaetea would have continued the development of the trireme as a long-range fighting ship. It was essential that some food and water had to be carried on board, otherwise the coastwise passage of four or five days to Corcyra with the necessary overnight beaching would not have been possible. An example of this difficulty is found in a passage in Demosthenes' *"Against Polycles",* quoted by Hornblower in a different context.[189]

We sailed from Thasos to Stryme, when it was still winter and there were no harbours, and it was not possible to disembark or eat our dinner because the terrain was hostile…

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[186] Casson: 1995, chapter 9.
[187] Thuc. 7.25.6.
[188] Thuc. 6.48.
[189] Hornblower: 1987, 41.

However, Xenophon relates how a fighting ship could beach overnight in enemy territory.[190] Describing the voyage of Iphicrates round the Peloponnese to Corcyra in 373, he says:-

...if he chanced to be taking the midday meal in a hostile country, he posted some on the land, as is proper, but besides he hoisted the masts on the ships and had men keep watch from their tops.....further, wherever he dined or slept, he would not have a fire inside the camp during the night, but kept a light burning in front of his forces, so that no one could approach unobserved.....And although they took both their noonday and evening meals in the enemy's country, nevertheless by doing only the necessary things, he always got to sea before the enemy's forces arrived to repel him and speedily got away again .

The Athenian fleet of 134 triremes with over five thousand hoplites (of whom only 1700 were Athenian) must have used a similar method on its voyage first to Corcyra and then along the southern coast of Italy. The warships would have beached along a considerable length of coast and any local opposition would have been overwhelmed by the numbers of Athenians and could not have prevented them landing and resting overnight.

The total number of the first invasion force as listed by Thucydides amounts to some twenty-three thousand three hundred and fifty combatants and oarsmen, apart from the crews of the accompanying merchant ships. If each man was allowed a daily ration of 1.36 kilograms of grain then the almost 32 tons a day required would have been used up in about three months, by which time the sailing season would have ended.[191] Further supplies in bulk would have become problematic and the stocks carried by the merchants would have been used up. In an operation similar to that supplying the Persian fleet seven decades earlier, the Athenian triremes needed supply ships to accompany them in order to feed their crews on a daily basis.

The alliance of the islands of Corcyra and Cleon with Athens was essential, as they were key concentration points for the Athenian naval

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[190] Xen. *Hellenica* 6. 2.29-30.
[191] Roth: 1991,164.

forces and supply ships preparing for the 120 kilometre open-water passage across the Adriatic Sea to the southern tip of Italy. In order to protect the merchant ships, the Athenians had to maintain a squadron of some twenty triremes at Naupactus at the entrance to the Gulf of Corinth. This meant an additional heavy demand on Athenian resources which could not be used to supply the forces in front of Syracuse.

The failure of the three generals, Alcibiades, Lamachus and Nicias to agree on a strategy , the recall to Athens of Alcibiades, and the death of Lamachus, left the invasion force under the command of the unenthusiastic and ailing Nicias who in a superstitious age, was known for his superstitions. The sea coast around Syracuse is mostly rocky, and a probably inadequate beach on which to over-winter their triremes, was found and occupied at Olympieium within the Great Harbour of Syracuse to the south of the city. As soon as the Athenians beached their ships, they were faced with a Syracusan army which, unlike the Athenians, had strong cavalry support. Nicias drew up half of his army eight shields deep as was the usual Greek custom for a hoplite battle.[192] The inexperienced Syracusans faced the Athenians sixteen shields deep. It is interesting to note that the other half of the Athenian army formed up in the rear also eight shields deep protecting a square of baggage carriers.[193] In reporting this arrangement, Thucydides infers that the crews of the navy and supply ships were a serious liability to the army, which had to provide protection for the non-combatants. It would seem that Nicias already had in mind a solution to a tactical problem previously unknown to Greek generals of having to use a significant part of his army to protect non-combatants who outnumbered the soldiers three to one, with nowhere to retreat if the enemy was victorious.

The Athenians defeated the inexperienced Syracusans, and with winter setting in, the victorious Athenians surrendered their advantage, vacating their base in the Great Harbour and sailing away to set up winter quarters in Naxos and Catana. No Greek general apart from Cimon had

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[192] Hackett J.*Warfare in the Ancient World.* Sidgewick & Jackson. London. 1985. 58.

[193] Thuc. 6.57.1.

ever fought a campaign so far from home over an extended period, and at that time organised siege-craft had not been a feature of Athenian military expertise. Nicias' inexperience was exposed in his hope that his early victory would persuade surrounding communities to supply grain to feed his troops until he attacked Syracuse the following spring.[194] Despite their shortage of grain and intention to persuade the surrounding peoples to supply them, the Athenians burned the growing crops around Megara, presumably to deny the Syracusans what they could not take for themselves.[195] Later that following summer the Athenians destroyed the water-pipes which ran underground into Syracuse.[196] Thucydides does not mention whether this ancient practice in siege warfare had any effect on the Syracusan resistance.

The size of the first Athenian camp in the Great Harbour does not seem to be appreciated by historians. The 5.5 metre-wide triremes needed at least 10 metres of beach to haul out their 30 ton mass. On first landing, the 134 triremes would therefore have needed a gently sloping strand at least 2 kilometres long on which to pull them all out of the water, as "Mediterranean mooring" would not have been practicable. The merchant ships would have had to remain afloat. If 10 square metres are allowed per man for sleeping, space, stores, cooking fire etc, the camp would have been about 150 metres deep, hence having a perimeter of some two and a half kilometres to defend. This does not include the space needed for the crews of the merchant ships and other camp followers. Had Demosthenes' reinforcements arrived then, the depth would have at least doubled, and many triremes left afloat as there would have been no more room on the beach. It should be noted that the distance from the mouth of the Anapus river to the Syracusan wall was a little over ten stadia or about two kilometres.[197] With many hundreds of fires burning every day, it would have taken only a short time for an area a long distance away from the camp to

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[194] Thuc. 6.71.2
[195] Thuc. 6.94.2 & 3.
[196] Thuc. 6.100.1.
[197] According to the map of the siege of Syracuse in the end-papers of the Loeb edition of Thucydides.

be denuded of firewood. That could perhaps have been another compelling reason for the subsequent Athenian withdrawal to over-winter in Catana and Naxos.

The fleet in support of the army

Throughout the Pentekontaetia the Athenian navy was the "senior service". It was acknowledged that an Athenian army or that of an ally usually played a supporting role to the navy, as for example in Phormio's campaign in the Gulf of Corinth in 429-8.[198] The Sicilian Expedition was probably the first occasion in Athenian military experience when the situation was reversed, that is, the navy being used in support of the army. The hoplite army of five thousand one hundred men, which had landed in Sicily had been shipped there with a trireme escort rowed by some sixteen thousand men, that is, three times the number of combatants and hence three times the number of men for whom food, water, firewood and shelter had to be found.

When in command of a trireme squadron in 424, Thucydides had been unable to prevent the Spartan Brasidas from occupying Amphipolis with an army not much bigger than the total number of the deck crews and oarsmen of his seven ships.[199] He might have realised that when their roles were reversed and triremes were used against an army, (which by definition meant a long way from home) they were extremely inefficient in terms of the relative amount of manpower required. The words he put in the mouth of Alcibiades advising the Spartans to:-

……..send (to Syracuse) by ship such a body of troops as, after working their own passage at the oar, can at once serve as hoplites,

This could have well been Thucydides' own opinion gained from his painful experience at Amphipolis.[200]

It was a revolutionary suggestion that Spartiates, should so demean themselves socially by becoming oarsmen! Alcibiades would have known that there had been a precedent in 428 when a shortage of funds obliged

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[198] Thuc. 2. 69. et seq.
[199] Thuc. 4.106.4.
[200] Thuc. 6.91.4.

Paches to use hoplites as oarsmen in his attack on Mytilene.[201] If the Spartans had accepted his advice they would made a huge savings of supplies. It seems that the Athenians also realised that their civilian-supplied commissariat, would be overwhelmed if their troops were sent with an escort of triremes. When Athens did send reinforcements in response to Nicias' appeal, the hoplites were carried in merchant ships instead of trooper triremes, which probably took longer, but with a great saving in manpower. The Spartans also compromised and did the same thing. The use of hoplites as oarsmen was apparently not considered by the conservative leadership of either side. Like the Persian fleet three quarters of a century earlier, the hoplites and the crews transporting them had only the overnight shelter they could improvise and the longer the voyage took, the more likely the soldiers' fighting ability would be reduced.

Nicias' letter to Athens

During his campaign the next spring, Nicias occupied the high ground known as Plemmyrium at the far end of the Great Harbour opposite Syracuse, which appeared at first sight a suitable location for hauling out his triremes which were being used to control the entrance to the harbour. His letter to Athens asking for either reinforcements or permission to withdraw, shows just how mistaken he was.[202] He describes how he could not dry out his triremes as they had to be constantly on patrol to keep the growing Syracusan fleet in check. Furthermore, there were no sandy beaches but a rocky shore-line. The site did not have a reliable water source and the firewood available was soon used up. That meant the trireme crews there and the occupants of the three forts had to go further and further away from the camp searching for water and kindling. Consequently, they were exposed to attack by the Syracusan cavalry from which the Athenians could get no protection, having only a few cavalry of their own. As a consequence the loss of skilled oarsmen meant that fewer ships could be fully manned to patrol the bay, and those that were crewed were in constant use and as a result of never being out of the water, were

[201] Thuc. 3.48.4
[202] Thuc. 7.11-16.

steadily rotting away. In logistical terms, failure to reconnoitre the site to ensure it had sufficient water and firewood available, resulted in steadily depleted crews and rotting ships. The Athenians had arrived in Sicily, with only a token cavalry force in a country well-known for its horsemen. They now suffered from this serious lack of judgement and the navy could not protect the army. The arrival of reinforcements under Demosthenes, doubled the number of Athenian hoplites and exacerbated the supply problem. The enlarged Athenian army was countered by Spartan intervention under the experienced Gylippus. The war then changed in character, becoming one of heavy infantry fighting over hilly and uneven ground, the Syracusans having peltasts and cavalry as well. Despite the fact that all the sea fighting was within the harbour, Nicias put his trust in his superiority in trireme numbers rather than persisting with infantry operations. However the Athenian navy became steadily less effective as it lost confidence, and was eventually defeated by the Syracusans. During the battle in the harbour the troops which were supposed to be defending Plemmyrion were surprised by Gylippus who captured the forts built there.[203] The forts held the garrison's supplies and also the masts and sails for forty triremes and the stock of spare oars. This was the second time the Athenians had been obliged to abandon their base and this time relocate in an unhealthy marsh. This meant that the Athenians had not only lost essential material, but could no longer protect supply ships entering the harbour, the chief reason for the subsequent deterioration of the army.

The only suitable sites on which to beach their ships were inside the Great Harbour. It probably never occurred to Nicias, or to the Syracusans, that he was unwittingly in a trap. The Spartan general, Gylippus, saw his opportunity and ordered the harbour entrance to be blocked with a barrier of old triremes chained together. By closing the entrance to the Great Harbour the Syracusans prevented supply ships from reaching the Athenians, forcing them to retreat from the city.

It is difficult to understand how Nicias, already defeated on land and sea outside the walls of Syracuse and unable to obtain sea-borne

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[203] Thuc. 7.23. et seq.

supplies, should, after an eclipse of the moon, be so influenced by his soothsayers' prognostications that he delayed the retreat of the army for 27 days.[204] Plutarch uses the phrase "another full period of the moon" but Diodorus writing four centuries after the event claims the delay was only three days.[205] Whichever is correct, the Athenians were already desperately short of supplies and the total destruction of their army might have been prevented if superstition had not been allowed to override common sense. However, Nicias was presented with a problem no other Greek general had ever had to solve. He had to conduct a retreat with ten thousand combatants protecting three times as many non-combatant oarsmen and camp followers who had to carry the supplies of food and water.[206] If the army formed up to confront their pursuers, the non-combatants would have been cut to pieces and the supplies lost. The only hope was for the hoplite screen round the non-combatants to hold off the enemy for as long as possible. It was a "lose-lose" situation and the result, total defeat.

Conclusion

In the seventy years after Salamis, the Athenians had built up a tradition of naval warfare over the relatively short distances between islands in the Aegean Sea. The military mind-set did not change. The navy, like the army, was paid a daily wage and the soldiers or crews purchased their needs wherever they came ashore, or lived off the land, whilst the commissariat remained in the hands of merchants who followed the army or the fleet.

With the promise of a reliable source of cereals, spurred on by the ambitions of Alcibiades, and without their generals having determined the political leanings of Italiot and Siciliot cities along their route, the voting Athenian public endorsed the expedition. Their leaders did not even know in advance which of the coastal cities on their route would provide them with food and water. Athenian *hubris* had generated such a level of self-

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[204] Thuc. 7.50.4
[205] Plutarch "Nicias" 23.6. and Diodorus 13.12.6.
[206] See appendix 5 for a discussion on Nicias' order of march.

confidence that they opened a “second front” in their war with the Spartans, and paid a terrible price for it.

There are interesting similarities between the Persian invasion of Greece and the Athenian invasion of Sicily. The Persians believed that with their enormous resources of money and man-power, victory was certain, and they were mobilised for it at the command of the despot Xerxes. The Athenians on the other hand had an extraordinarily optimistic self-confidence of certain victory, which every citizen shared, and had democratically voted for war in Sicily after listening to public speeches for and against the venture.

Both expeditions attempted the capture and destruction of large thalassic cities a long way from their bases. In both cases the defenders were outnumbered. There was only a small proportion of Persian troops in the multinational Persian army whilst the navy was manned entirely by subject peoples. Per contra, the powerful Athenian navy was built and manned mainly by its own citizens which supported an army consisting of a large proportion of allies most of whom were from other parts of Greece. In both cases disagreement about strategy and failing supply lines ended in the defeat of the aggressors.

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CHAPTER FOUR.

THE HELLESPONT REVISITED: applied logistics.

The Greeks considered all peoples outside of Hellas to be barbarians, and, without exception, uncultured and uncivilised. They included the Macedonians who, until the reign of Philip II (359-336) probably deserved the appellation. Philip made great efforts to hellenise his subjects to the point where he hired Aristotle to tutor his son, Alexander.

Greek notions of their superiority probably contributed to their failure to apply logistical principles to the organisation of their armies and navies, but Philip, who was both a political and military genius, soon became an opponent to be reckoned with. His forebears had seen and no doubt passed on their observations of the slow-moving Persian armies which had invaded their territory a century before his time. Philip transformed his army into a highly-trained mobile force. The use of carts was forbidden, and servants were restricted to one for every ten foot-soldiers and one for each cavalry-man. They carried hand-mills for grinding grain, and other equipment. On average, there would have been one camp-follower for four combatants. Philip apparently forbade wives and women to accompany the army. The foot-soldiers, precursors of "Marius' Mules", were expected to carry their arms, armour, utensils, and provisions for a few days, whilst on the march. Pack-animals were kept to the minimum.[207] His battle formation of the phalanx armed with the 5 metre long *sarissa* was irresistible, and with it, Philip destroyed the concept of the *polis* at Chaeronea in 338. Alexander was perhaps more Greek than the Greeks, and with the army he inherited from his father, went to war with Persia in 334 in revenge for their destruction of Athens a century and half before.

The sources

Alexander's expedition was well documented by ancient authors, particularly Arrian, Curtius, Diodorus Siculus, and Plutarch, none of whom were anywhere near contemporary. They probably drew on the favourable

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[207] Engels: 1978,12-15.

accounts of Alexander's associates, Ptolemy, son of Lagus, and the apologist Aristobulus.[208]

Crossing the Hellespont

None of the sources state where Alexander concentrated his army before commencing his march to the Hellespont to cross into Asia.[209] Arrian says simply that Alexander marched to the Hellespont in the spring (of 334) with "not much more" than thirty thousand infantry and five thousand cavalry. Using a ratio of one camp-follower to four combatants, the total force would have numbered about forty-four thousand. Arrian begins his account with the army already on the march at Lake Cercinitis.[210] Engels suggests that Alexander concentrated his army at Therma during the winter, recognising, like Xerxes before him, that it had excellent communications and a plentiful water supply. Furthermore the bulk of his supplies could be more efficiently carried by ship as far as Sestos on the Hellespont some 500 kilometres, (or 20 marching days) away. Engels, (quoting Plutarch's "Life of Alexander") says that the army carried a 30-day supply of cereals with them, as water and forage would still be plentiful en route and avoided taking food stocks from their own countrymen.[211] Using Engels' estimate of 1.36 kilograms of cereal per day per man, the amount of grain carried at the start of the expedition would amount to one thousand eight hundred tons, which could be carried in five large cargo ships.[212]

Arrian says that Alexander's army marched by way of the coastal towns of Amphipolis, Abdera, and Maronea where they could be revictualled from the accompanying ships.[213] This march of twenty days should be compared with the 74 days taken by the Persian army along the same route in the reverse direction from the bridge of boats to Therma.[214]

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[208] Engels: 1978, 6.
[209] Engels: 1978, 26.
[210] Arrian. *Anabasis of Alexander* 1.11.3.
[211] Engels: 1978, 27.
[212] Engels: 1978, (26n) quotes Thuc. 7.17. 6 that a cargo ship could carry 400 tons. Casson: 1995. confirms this rather risky assumption for ships built 70 years after Thucydides.
[213] Arrian 1.11.4.
[214] Maurice: 233.

This is a vivid example of how a cumbersome supply train slowed down a marching army.

Engels points out that when the army arrived at Sestos it still had ten days supplies which were probably stored in the ships. This strategy would have allowed the grain in the fields to ripen and allow the Macedonians to secure a bridgehead on the Asian shore if their landing was opposed by the Persians. Furthermore, the ships could unload stores at Asian ports like Arisbe and Lampsacus prior to the army moving inland.[215]

Arrian says that the army was ferried across the Hellespont from Sestos by means of 160 triremes and "a good number of cargo boats" presumably to Abydos on the Asian shore.[216] The carrying capacity of the trireme had no doubt improved in the 150 years since Salamis and it can be assumed that a trireme used as a trooper could hold up to one hundred soldiers. Given that four triremes could load and unload at the same time on both sides of the strait, using a sort of "shuttle service" in a constant stream, allowing half an hour to load and then unload 100 men and allowing one hour for the approximately five kilometre crossing, the whole army could have been taken across the Hellespont in three days. This operation would have used up three of the ten days' supplies still available - a point Engels omits. It would also be interesting to know from where Alexander obtained the 160 triremes he needed for a rapid crossing of the Hellespont. As he was the *hegemon* of Greece, he probably requisitioned them from all round the Aegean, Athens in particular. If the triremes were rowed with only two of the three tiers of rowers, then food had to be found for about sixteen thousand oarsmen, another 22 tons a day!

In the event, Alexander's landing in Asia was unopposed and he was able to commence his incredible conquest of most of the known world and some which was not. His grasp of the capabilities and limitations of logistics was probably better than any general since his time. Alexander showed, exceptionally, that Artabanus could be mistaken. As Engels has put it:-

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[215] Engels: 1978,29.
[216] Arrian. 1.11.5

"The terrain of the Persian Empire was in a real sense the Persian king's most formidable weapon. Its extensive deserts, salt wastelands, barren, impenetrable mountain ranges....were immense obstacles to any invading army".[217]

By cutting out the masses of camp followers essential to the Persians; and by careful forward planning, neglected by the Athenians, Alexander succeeded with his small army where Persian forces in Greece and Athenian forces before Syracuse, both more powerful than their opponents, had failed.

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[217] Engels: 1978,121.

CONCLUSION

Both the Persians with their enormous resources and Athens with her very much smaller armament had a common attitude of mind. They were both certain of victorious conquest. The driving forces were however quite different. The Persians sought revenge, the Athenians a reliable source of cereals.

The Persians commenced not only the planning, but actual work, years in advance of their invasion of Greece. By contrast, the Athenians began preparations for the Sicilian expedition only a few months beforehand. The Persians set up food dumps for a huge army which could not possibly "live off the land". The Athenians relied largely on accompanying merchants to maintain supplies. Scholars differ about the location of the biggest Persian dump at a site named Leuce Acte. It is here suggested that this important supply point was at the head of the Thermaic Gulf where the Persian army and navy were concentrated before invading Greece.

A likely reason for the Persian defeat at Salamis was the steadily deteriorating shipboard conditions and mounting hunger, thirst and weariness of the oarsmen of their fleet. The aristocratic Persian commanders probably had no idea of what life was like in the crowded hulls of triremes. A similar assessment can be made for the condition of the ordinary Persian infantryman at Plataea.

The planners would certainly have had a good idea of the useful life of the bridges of boats. If they became unusable before the army could be withdrawn, then the army was like the trireme crews, expendable ("…..what are a few planks?").[218] Xerxes had gained his revenge for Sardis and Marathon by burning Athens to the ground. The enormous logistical cost in men and materials was of no consequence.

The Persians made no further attempt at a military adventure in Europe. However, they achieved their aims at no risk to themselves by strategic use of the most useful of all logistical devices – money. Floods of darics paid for

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[218] Herodotus lived in a slave-driven society, and probably had no difficulty in putting those words into the mouth of Mardonius.

Persia's enemies to fight each other, and in the course of time the Great King, now Artaxerxes, was able to dictate an advantageous peace.[219]

The colonisations of Amphipolis give the impression that the Athenians imitated Persian methods in shipping in mostly foreigners to populate and defend their new foundation. Despite the importance of the colony for its supply of timber and precious metals, as well as its strategic value as a strongpoint to protect the Thraceward region, a confidence was placed in inhabitants with suspect loyalties, which proved disastrous.

The topography of Greece with its many narrow valleys resulted in the creation of small political units, the *poleis,* engaged in endemic warfare. Wars occurred almost annually and lasted a few weeks at most between the sowing and reaping of crops. Battles were fought at locations where there was enough level ground in a valley, for the land-owning gentlemen-farmer hoplites to engage in their spear against spear shoving matches. With the exception of the Spartans, whose every fit citizen was a full-time soldier, the concept of an organised commissariat to plan for, and deliver supplies to the army was entirely missing. In the case of Athens, the trireme crews had a daily rate of pay with which they had to buy their own supplies when ashore. This mind-set persisted until the shortage of man-power obliged Athens to hire Thracian mercenaries to fight at Syracuse in 414, and the professional Greek soldier began to appear on battlefields as, for example, Xenophon's "Ten Thousand" at Cunaxa in 401.

There is an interesting parallel between the Persian invasion of Greece in 480 and the Athenian assault on Sicily seventy five years later. Both were mounted by forces overwhelmingly superior in numbers to their opponents. Both were fought at the end of very long supply lines, neither of which was sustainable, the former by the demands of sheer numbers and the latter by the habitual use of outside agencies of doubtful reliability in the form of private merchants.

On the other hand, the two campaigns were quite different in that the Persian invasion was carefully planned at least four years in advance, the "high command" being well informed by the use of spies. The Athenians

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[219] Xen. *Hellenica.* 6. 31.

made their arrangements to attack Cyprus under Cimon, and to invade Sicily only a few months in advance of the decisions to attack, and with limited knowledge of the intended battlegrounds. It is true that Nicias was Syracusan *proxenos* in Athens, but he had not necessarily ever visited that city. The custom of allowing private enterprise to supply both their army and navy persisted. The Athenians were so confident of success that they did not even find out in advance which of the coastal cities in Italy would allow them supplies of food and water. Athenian *hubris*, personified in Alcibiades, believed that they were capable of defeating their enemies without the need for detailed forward planning. They used the same methods for a large-scale, long-range war as they always had done in their frequent small wars within peninsular Greece. Civilian merchants still followed the navy with merchant ships and the army with a string of loaded pack-animals, and went home again with the combatants' drachmae to stock up another shipment.

Another aspect of Athenian over-confidence was that it did not seem to have crossed their minds that Syracuse was a city much the same size as Athens, with extensive maritime interests, including shipbuilding and, backed by Spartan military expertise, would be able to resist them. The "shock and awe" of the arrival of the Athenian fleet before Syracuse was soon dissipated by the invaders inability to take by assault the nearby small town of Hybla Geleatis. [220]

Despite their remarkable recovery from the Sicilian disaster, the Athenians still did not learn the necessity for logistical planning. *Hubris* persisted, and their final defeat at Aigospotami was entirely due to scorn for their enemy, the Athenians leaving their beached ships undefended whilst their crews went to buy food in nearby communities.[221] Their persistence in going to war without a properly organised commissariat finally cost them total defeat, the humiliation and starvation of their city and the loss of their empire.

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[220] Thuc. 6.63.5.
[221] Xen. Hellenica. 2.23-30.

Appendix 1.

The diameter of the bridge cables.

Herodotus reports at 7.36, that the cables weighed one talent per cubit. In modern metric terms this becomes 26 kilograms per 46 centimetres.[222]For convenience of calculation these numbers can be rounded off to twenty-five thousand grams per fifty centimetres. The specific gravity of the cable can be taken as unity, so that the radius (r) of a cylinder of twenty-five thousand cubic centimetres in volume and length of fifty centimetres is:-

$$\pi \times r^2 \times 50 = 25\,000$$

$$\text{so } r^2 = 25\,000/ (50 \times \pi)$$

$$= 159$$

$$\text{then } r = 12.6 \text{ centimetres}$$

$$\text{hence diameter} = 2r = 25 \text{ centimetres}$$

Hammond and Roseman calculate the diameter to have been 23 cm using rather more sophisticated rope-making data.[223]

If it is accepted that Herodotus' report of the size of the cables is correct, why did the Persians opt for six cables of such an unmanageable diameter? Very large numbers of men would have been required to make them and get them into position on the bridges. If cables of one-eighth of the cross-sectional area had been woven, forty-eight would have been needed, each with a diameter of 9 cm, a size easily produced by the rope-makers and not too thick to be grasped by the hand. The breaking strain of eight 9cm diameter cables would be about the same as one of 25 cm diameter.

Darius I used the immense resources his Persian empire to carve the story of his triumphs into the almost unreachable cliffs of the Behistun Pass

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[222] The talent was about 20.2 kg and the cubit was about 45.7 cm according to *Webster's New Collegiate Dictionary.* G.Bell & Son. London. 1959

[223] Hammond and Roseman: 99.

high in the Zagros Mountains. His son, Xerxes, similarly demonstrated his power by employing thousands of men on the four-year task of cutting a canal through the Athos peninsular. His army of hundreds of thousands, fleet of thousands of ships and massive food dumps to feed them, showed those who dared oppose him, that the vast resources of men and treasure of the Persian empire could successfully overcome any resistance. Perhaps it was another demonstration of omnipotence that cables of such extraordinary size were fabricated for his bridges over the Hellespont, instead of using those of a size which would have been made by those he considered to be lesser peoples.

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Appendix 2.

"Under the Lash"

Herodotus has been translated as using the phrase "under the lash" (7.23.) or "under the whips" (7.58.). The former refers to the workmen who were digging the Athos canal being "under the lash", and the latter to the army crossing the bridge of boats being encouraged with whips to hurry them up the steep slopes behind the beaches. In the first case, several thousands of men would have been at work digging the canal. The reader is tempted with a mental picture of slaves groaning under overseers' whips beloved of American makers of epic films. How and Wells in a comment on the words 'υπο ματηκον (7.22.1), note that whipping was repulsive to free Greeks.[224] Liddell and Scott interestingly translate 'ορσσειν 'υπο μαστιγων as "to dig by *constraint* of the lash"

Urging on the workmen with whips would have required a very large number of overseers who would have been much more productive if they had also helped to dig. Herodotus tells (7.117) of Artachaees, a high-ranking Persian in charge of the work on the canal who had "the loudest voice in the world". Perhaps he carried a whip as a symbol of office, and had some assistants, rather like Roman lictors, whose rods were symbolic rather than punitive.

In the second case it is hardly likely that elite troops like the "Ten Thousand" were whipped up the steep paths away from the Hellespont beaches by men who were their military and social inferiors. A column climbing up a steep and narrow path cannot move faster then the slowest marchers. Here again, it is perhaps better to think in terms of an elite Persian "military police" who carried whips and certainly whipped the pack animals, but probably cracked them over the heads of the troops whilst shouting at the marching columns to "get a move on".

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[224] How and Wells *"A Commentary on Herodotus"* 2.134

Appendix 3.

The Transport of Cereals

Professor J. Roth of San Jose State University, in a personal communication says that:-

The Isis Geminiana fresco, Ostia (2nd/3rd century AD) shows the loading of a ship. A porter pours a sack (or leather bag) into what appears to be a barrel on the deck of the ship. The sack is labelled "RES" but is clearly grain. It seems to me that if the ship was loaded with sacks or bags this measuring out would have been unnecessary. This suggests that grain was loaded loose in ships. This seems unnecessary and uneconomical to us, but it may well have been that the cost of leather bags exceeded the labour costs of loading and unloading grain in this manner.

It is to be hoped that underwater archaeology will be able to provide an answer to this question. In the meantime it is accepted that for reasons of economy the Persian grain was carried loose despite the risk of spoilage of the cargoes.

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Appendix 4.

The water requirements of trireme crews.

Herodotus does not discuss how much water was needed or carried by trireme crews, probably because it was common knowledge in his day. If, as it is suggested, thirst was a contributory factor to the Persian defeat at Salamis, the assertion requires substantiation.

As has been shown above, "Mediterranean mooring" on a beach, would place very heavy demands on any nearby water source, and a long time would be needed before every man had had the opportunity to get ashore to quench his thirst and fill his water container.

On the morning of Salamis, the Persian crews had already been afloat overnight and most of the previous day, with very little respite - if any. Bowen poses the question; how much drinking water does an oarsman need at sea through an August day in the Aegean?[225] He mentions the experience of Tim Severin whose "*Argos"* crew rationed themselves to one and a half litres a day whilst under sail in the Black Sea, and not rowing.[226]

He goes on to mention a rowing trial of the "*Olympias*", a modern reconstruction of a trireme, where, in a passage of some eight and a half hours, each man had two litres of water available. He also has noted another two-hour trial row during which the oarsmen drank up to four litres of water. He quotes Coats and Morrisson's observation that on a hot day the *Olympias'* oarsmen needed a litre of water an hour when working hard. In his view the ancient oarsmen would almost certainly have taken gourds or skins of water aboard with them but would probably have been restrained in their use, being accustomed to drinking sparingly.

It can be concluded that the combined factors of length of beach and the volume of any water supply found nearby, set a limit to the number of ships which could use it. This was a serious logistical problem for the Persians, the solution of which required a survey of every beach in Thrace, Macedon and Greece likely to be needed by their fleet.

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[225] Bowen: 359.
[226] Severin T.*The Jason Voyage.* Guild Publishing.London.1985.

Appendix 5.

Nicias' retreat from Syracuse.

Thucydides describes how Nicias arranged the order of march in his retreat from Syracuse, and in doing so leaves probably unanswerable questions. He relates that in forming up for the march, the forty thousand surviving men were divided into halves, the twenty thousand fittest under Nicias and the weaker men under Demosthenes. It is remarkable that in the confusion and dismay, Nicias was able to assign five thousand hoplites and fifteen thousand non-combatants to each group. C.F. Smith in the Loeb edition, Rex Warner in the Penguin and Grote in his "History of Greece" expand 'οχλον 'εντος ειχον οι 'οπλιται at 7.78.2 to suggest that the army formed up in two hollow squares. [227]

And now the army began the march, arrayed in a hollow square...The baggage-carriers and most of the miscellaneous throng were enclosed in the ranks of the hoplites. (Loeb).

The words "hollow square", (which are not used by Thucydides), are contradicted by the next sentence which says that the hoplites surrounded the solid mass of non-combatants. The shape of the compact mass of men is not mentioned. We assume that the "miscellaneous throng" was unarmed, but as oarsmen were by that time being used to some extent as light infantry, they might have been able to pick up discarded weapons in order to defend themselves. The formation of a tightly-packed mass of non-combatants protected by a ring of hoplites was unique in Greek military experience. How did Nicias know more or less accurately, the numbers of hoplites, oarsmen and camp-followers carrying the food and water supplies, which had to be organised into two equally sized groups? It is unrealistic to suggest that he actually calculated the size of a square containing twenty thousand men, of whom about five thousand were hoplites. He probably got the solid mass of men and pack-animals into as compact a shape as possible, and then formed up the hoplites round them.

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[227] Grote at 7. 463 says, a little differently; *"The army was distributed in two divisions; the hoplites marching in a hollow oblong ,with the baggage and unarmed in the interior."*

A hoplite needed a fighting space which Vegetius says was one metre laterally and two metres between ranks, so the two masses of men would have been more or less in a square or rectangular formation about 300 metres wide at the start of their march.[228]

The previous year, Nicias had fought and defeated a Syracusan army whose line of battle was sixteen shields deep, whilst his hoplites were formed up in the more usual eight shield formation. He protected his non-combatants with a reserve of hoplites eight shields deep.[229] Thucydides gives the impression that Nicias expected the Syracusans to contest his retreat in a set-piece action using the same order of battle which had opposed him before. If that was so, his "squares" were not intended to be in order of march but rather in order of battle, some eight shields deep and over 140 wide.[230] A battle line of that width and depth could punch a hole through the ranks of the opposing army and defeat it by sheer weight of numbers. If he had won the major battle, he anticipated, he would have been able to re-form into columns for his planned ascent of the Anopus valley and through the narrow gorge at its head-waters, where he did not expect to find any opposition.

Unfortunately for the Athenians, the Spartan general Gylippus, although trained in traditional hoplite warfare, unexpectedly made no attempt to oppose them with all his forces in a full-scale battle. The Athenians defeated the initial Syracusan opposition near the mouth of the Anopus, but as they turned up-stream, Gylippus used his numerous cavalry and javelin-throwers in "hit and run" attacks on the two Athenian formations. The Athenian cavalry was heavily outnumbered and fled. The constantly harassed Athenians reached the head of the valley only to find their path blocked by a wall and a Syracusan force "not a few shields deep" forcing them into a retreat which ended in disaster.

There have been several attempts from the 1890's onwards to

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[228] Webster: 1981, 231. quoting Vegetius 3.9.
[229] Thuc. 6.67.2.
[230] Assuming that the two groups were more or less in squares, there would have been about 140 in the outside ranks, being the square root of 20 000.

reconstruct Nicias' march. Evans points out that the experience of a single scholar, walking the route of the retreat, is not an army. Unlike the Athenians he is not under attack whilst suffering hunger and thirst, and so cannot make a satisfactory reconstruction.[231]

Only the hoplites leading the march and those on the left hand side of the squares could offer immediate resistance to the Syracusan attacks. They carried their shields on their left arms, and so were ready to fight. Those on the right hand side would have had to turn right, and those at the rear to about turn, in order to face the enemy and shield themselves. This would have left the non-combatants unprotected whilst the hoplites stood and fought. The formations, whatever shape they were initially, would have been distorted in any case when marching over uneven, hilly country. It is unlikely that a regular shape could have been maintained through the first day of the march as the Athenians climbed the narrowing river valley under constant enemy pressure. Once again, hunger, and particularly thirst, were important elements in the defeat of the retreating army and cohesion would have been lost long before it was destroyed on the Assinarus eight days later.

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[231] My thanks are due to Dr. R. Evans for allowing me access to a proof of his forthcoming book, *Ancient Syracuse: A Topographical History.* Pretoria 2006

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