SOME PROBLEMS OF SHIP OPERATION IN HARBOUR

In my contribution to the 1987 Symposium, I discussed the evidence for the use of timber on shipshed ramps, and the type of operations which could be carried out in the shipsheds. I start this paper by producing some additional evidence, from Carthage and from Kos.

The evidence from Carthage comes from a small supplementary excavation carried out on the *Ilôt de l'Amirauté* in 1980, on one of the ramps (13) on the west side of the island.[1] It was not a simple slipway like those previously found (e.g. 16)[2] but was divided into a series of small chambers or pits cut slightly below the general slope of the ground, separated by low walls and with their sides retained in place with mud bricks; to the excavator they looked as if they were secondary features cut into a regularly sloping ramp. Carbonised remains of two substantial squared timbers lay across the ramp at the divisions between the lower three pairs of pits, more widely spaced than the similar timbers found in the surface of Ramp 16. Hurst plausibly suggests that Ramp 13 was designed for repairs or maintenance of ships' hulls, with the keel resting on the central division, and working space being provided by the pits on either side; the cross timbers would have served, Hurst presumes, for the surface on which the keel itself, or a timber cradle carrying the hull, slid when a ship was moved. (Hurst does not mention the possibility of longitudinal runways laid on the sleepers; evidence of these was found on Ramp 16, but not on Ramp 13).

Thus we have more evidence that easier access was provided to the ship's bottom in at least some shipsheds.

The evidence from Kos comes from recent and so far unpublished excavations. A shipshed of the Hellenistic period has been discovered, which has well cut slots in opposed pairs on the inner side of stone courses running down well within the full width of the shipshed; in my estimate the sleeper length would have been under 3m in a total shipshed width of just under 6m. We look forward to more details from our Greek colleagues on this important find.[3]

There is thus no doubt about the use of horizontal timber sleepers on slips. The alternative explanation, that they were slots for timber shores, can be put aside; this is not to say, however, that shores were not used to support a slipped ship - Basch has recently plausibly so interpreted two frescoes from Pompeii which show timbers apparently projecting from the oar-box of a slipped warship.[4]

One feature of the shipshed remains at Rhodes, which I discussed at our last symposium, deserves more emphasis: there is clear evidence now of at least two widths of shipshed. The first is the "traditional" type,with a clear width of about 6m, which is rightly associated with the trireme (but also, we must assume, with the tetreres and penteres, since there is no clear evidence of alternative provision for them, e.g. at Piraeus). The second type can now be roughly defined, having a clear width of somewhat over 4m; further finds may call for further refinement. The narrower group of shipsheds at Rhodes have a clear width of 4.20-4.40m; those at Dor 3.80-4.50m; the possible remains at Phalasarna 4m; the possible remains at Antikirrha 4.20, 4.50, 4.70m (apparently widening seawards). These would have been for smaller warships such as hemioliae or possibly trihemioliae.[5]

Not all shipsheds will fal into these groups: for example the narrow ones for the two guard-ships at Sounion (2.60m wide).

One aspect of the use of timbers in slipping ships seems to have been overlooked: we do have the ancient Greek word for them - φάλαγγες or φαλάγγια. The word φάλαγξ more usually means a trunk or round piece of wood, but the word is used in two literary descriptions of the launching of the Argo, by Apollonius Rhodius (I 375) and in the *Orphic Argonautica* (270). Apollonius Rhodius describes how the Argonauts dug a launching trench "deeper and deeper" down the beach, and in the trench laid "smoothed timbers" (εν δ' όλκῷ ξεστάς στορέσαντο φάλαγγας) and tilted the ship on to the first timbers[6].

In the *Orphic Argonautica* the Argo, answering an Orphic call, "ran down so quickly that she scattered the close-set timbers (θαμινάς... φάλαγγας) which lay under the keel; one sole stretched cable sufficed".[7]

The grammarian Pollux lists phalanges and phalangia among the equipment of the "ship-hauler" (*neolkos*),[8] and there are other such references to *phalangia* in the lexicographers: normally translated "rollers", though the timbers could of course be fixed skidways. That is certainly the case with their use in a dry dock, attested in a fragment of Callixenus' On Alexandria. He describes a huge "forty" (reign of Ptolemy IV: late third century BC) which needed special arrangements for its launching - a cradle said to have been put together from the timbers of 50 *pentereis*, pulled into the water by a crowd. Then a Phoenician later had the idea of a dry dock into which the ship could be floated, for ease of launching and perhaps also for periodic maintenance. When the water had been pumped out "the ship sat securely on the above-mentioned *phalanges*".[9] The term *p(h)alangae* is used with the same meaning in Latin.[10]

I turn now to the subject of epigraphic evidence for harbour operations. It is admittedly sparse (with the obvious exception of the Athenian Naval Lists which still await a definitive study and publication), but what we have needs to be fully analysed and exploited.

A decree regulating harbour operations in second-century AD Ephesus has received little attention. This decree by the Roman governor of the province of Asia tried to control abuses in the harbour. Merchants importing marble must not unload it on to the quay, because its heavy weight imposed a heavy strain on the piers that supported the quay. Furthermore, importers of timber must not saw their timber on the quay, because the sawdust was threatening to choke the channel of the harbour (a problem already attested for Ephesus). A fine was prescribed for these offences, and offenders also had to appear before the governor "since his supreme majesty the emperor has a special concern for the efficiency of harbours".[11]

This last remark confirms the conclusions of Boyce's persuasive study of harbour coinage of the second century AD on the degree of imperial concern for harbour development in the Eastern Empire.[12]

The text as a whole provides that rare shaft of light about harbour operations in detail, something which we badly need and which primary sources such as inscriptions can provide. The value of inscriptions is that in many cases they illustrate the typical and the routine rather than the untypical and the extraordinary, unlike most ancient ship descriptions in literary texts and probably also the ship monuments from Samothrace and Delos which are the subject of much present discussion.

Houston has argued that the lack of epigraphic reference to harbour operations or repair in the Roman period indicates a lack of harbours needing much maintenance or administrative involvement.[13] I am not sure how valid is the *argumentum ex silentio*, and particularly not if it is projected back to the Classical and Hellenistic Period.

That harbour regulations were never a large body of material could perhaps be deduced from the fact that in the literary evidence for Rhodian sea law only one harbour regulation is preserved.[14]

I turn now to my main subject of discussion: the harbour regulation, on an inscription from Thasos, dating from the second half of the third century BC. The marble slab was discovered in 1930 in the Genovese fourteenth-century tower near the port, demolished in 1931, and was published by Launey in 1933. The inscription must have originally been displayed in the harbour area.[15]

Launey reported that the four sides of the stone are preserved; it was broken in two during extraction from the wall, causing the loss of a few letters in the first line. The inscribed side faced outwards when re-used in the tower and, being of friable local marble, suffered severe weathering. The text was thus extremely difficult to read, and Launey was unable to make a legible photo or squeeze. The beginning and end of the lines are difficult to define except by a slight apparent inset or cartouche, surrounded by a less polished border. Launey dated the text by the letter forms and published a majuscule text, republished in miniscule in the supplement to *Inscriptiones Graecae* XII[16].

[ΠΛ]οῖον ΜΗ [Α]ΝΕΛΚΕΙΝ ἐΝ ΤοῖC ΤῶΝ ..ΡΓ... Τοῦ ΜὲΝ ΠΡѠΤοΥ ἐΛΑ[ϹϹѠ ΦΟΡ]-
[ΤΟΝ ἌΓΟΝ ΤΡ]ΙϹΧΙ[Λ]ΐѠΝ ΤΑΛΑΝΤѠΝ, Τοῦ ⟨Δὲ⟩ ΔΕΥΤΕΡΟ[Υ] ἐΛΑϹϹѠ ἌΓΟ[Ν] ΠΕΝΤΑ[Κ]ΙϹ·
Χ[ΙΛΐѠΝ] ΤΑ[ΛΑΝΤѠ]Ν. ὃϹ Δ' ἌΝ ΠΑΡὰ ΤΑῦΤΑ ΑΝΕΙΡΥΧΗΙ, ΑΠΟΤΕΙϹΑΤѠ ΠΕΝΤΕ [ϹΤΑ]-
[ΤΗΡΑϹ] ΤΗῚ ΠΟΛΕΙ· ΠΡΗΞΑΝΤѠΝ Δὲ ⟨Οῒ⟩ ἐΠΙϹΤΑΤΑΙ. ἌΝ Δέ ΤΙ ΑΜ[Φ]Ι[ϹΒ]ΗΤΗΤ[ΑΙ],
5 [ΔΙΚΑϹΑϹΘѠΝ Οῒ] ΑΠΟΛΟΓΟΙ ΠΑΡὰ ΔΙΚΑϹΤΑῖϹ ΑΥΤΟῖϹ· ΤΗΝ Δὲ ΚΑΤΑΔΙΚ[Η]Ν [ΠΑ]-
[ΡΑΟΝΤѠΝ Τ]Ο[Ῐ]Ϲ ἐΠΙϹΤΑΤΑΙϹ· οῒ Δὲ ἐΚΠΡΗΞΑΝΤѠΝ. ἌΝ Δὲ ΜΗ ἐΚΠΡΗΞѠϹΙ[Ν, ΑΥ]-
[ΤΟῚ ΟΦΕΙΛΟΝΤѠ]Ν. ἌΝ Δὲ Οῒ ΑΠΟΛΟΓΟΙ ΜΗ ΔΙΚΑϹѠΝΤΑΙ Ἢ ΜΗ ΠΑΡΑΔѠϹΙΝ ΤΟῖϹ
[ἐΠΙϹΤΑΤΑΙϹ, ΥΠ]ΟΔΙΚΟΙ ἔϹΤѠϹΑΝ ΤΟῖϹ ΕΙϹΙ[Οῦ]ϹΙΝ ΑΠΟΛΟΓΟΙϹ .ᵗ̄⁵.
[....ᶜ·⁸... ΤΟῖϹ ἐΠ]ΙϹΤΑΤΑΙ[Ϲ] ΤΟῪϹ ΠΑΡὰ Τὸ [Υ]Η[Φ]ΙϹΜΑ ΑΝΕΛΚΟΝΤΑϹ ?ᵗ̄³
10 [- - - - _ᶜ·²⁵_ - - - - - ΤῶΙ] ἐΘΕΛΟΝΤΙ ΕΙ - - - - - - -

The text is of a decree, but simply publishes the regulation voted in the decree, without any traditional formulae. It was intended as a public notice and starts straightaway with the key words of the prohibition: "Do not haul out a merchant ship...". Lines 1-3 give the full regulation; the rest of the inscription describes the penalty imposed on those contravening the regulation, and the obligations of various officials involved in exacting the penalty.

The regulation forbids the "hauling out" of merchant ships below a certain tonnage: for each of two places (parts of the port?) the minimum permitted tonnage is specified. The second numeral is clear: 5.000 talents (line 2/3); but the first numeral is not certain. Launey read "three thousand" but alternatives must be considered. All that can be read is *]ιοχι[λ]ίων*.

The missing words in line 1/2 are fairly well defined by the sense required (and repeated in the second clause). We must restore a participle *ἄγον* agreeing with *πλοῖον*; the only doubt concerns the object of the participle: simply *ἐλά[σσω]* as a neuter accusative plural (sc. *τάλαντα*), or a noun in the accusative singular, such as *φόρτον* or *γόμον*, with *ἐλά[σσω]* in agreement? Launey preferred the latter, which leaves little space to restore any numeral longer than *τρ]ιοχι[λ]ίων*. If we accept the former alternative, then, as Launey rightly pointed out, the numeral *τετρακ]ιοχι[λ]ίων* would fill the space better. Launey acknowledged that epigraphically the restorations *ἑξακ]ιο* and *ἑπτακ]ιο* cannot be excluded, but felt that they fit the space less well; he was also unhappy about a reference to such high tonnages: "if we restore such a high numeral we should be banning the majority of ships from the shore of the port". On this point let us reserve our position.

The main objection to *τετρακ]ιο* is that 4.000 in the first clause is too close to the (certain) numeral 5.000 in the second clause, providing too small a margin between the two categories of ships. This argument I find plausible, and it applies equally to *ἑξακ]ιο*, 6.000. But it does not prove the restoration *τρ]ιο*, 3.000, for there remain the alternatives *ἑπτακ]ιο*, 7.000 (we can hardly go higher, I think), or *δ]ιο*, 2.000 (which Launey finally admitted to be possible, but did not take seriously).

Therefore, if we accept that the margin between the two figures is likely to have been 2.000 or 3.000 talents rather than 1.000, then we are left with the alternatives 3.000 (as Launey), or 2.000 or 7.000 talents. I do not conclude that the restoration 3.000 is definitely wrong, but simply that it is not definitely right; and that it is unfortunate that the publication in *Inscriptiones Graecae* does not transmit (e.g. in a footnote) any of the points made in Launey's discussion, but only his conclusion - which, admittedly, he expressed with confidence.

Thus my conclusion on the numeral has to be negative - that it is difficult to use as evidence of merchant ship size. This point was made against Casson by Hopkins in 1983, but Hopkins ignores the point that Casson adduced other evidence as well.[17] Casson, a believer in large ships, had concluded (using the reading 3.000 in this inscription as one of the pieces of evidence): "the smallest craft the ancients reckoned suitable for overseas shipping was 70-80 tons burden". What,

I wonder, is Casson's reaction to the possibility of the reading 2.000 (some 52 tons burden)?

There are some other points in the inscription which deserve discussion. First, we have evidence that merchant ships were hauled ashore, within a port.[18] The technical term is used: ἀνέλκειν (ll. 1,9) and the alternative ἀνειρύειν (l.3, a poetic and Ionic form of ἀνερύειν). No more precision is given. Were the ships slipped in shipsheds? - something we have thought unlikely because of the beam; or on open slips? - if so, they were special ones; or simply on an open beach? It should make one cautious in assuming that the shoreline of commercial harbours was entirely lined with quays; though of course the evidence of this inscription from Thasos can strictly only be applied to Thasos.

The very fact that the ships could be hauled out is, perhaps, an argument against a high numeral in the first clause, even if we assume that winches were used and that they were dealing with unladen weight. What sort of net tonnage were they dealing with? I compare Coates' estimate of a trireme's weight at slipping of 25 tons.

Secondly, the regulation specifies the minimum size of ship which it was permitted to haul out within two parts of the port. Why was a minimum size of ship specified? Casson, accepting the reading "3.000", argued: "the clear implication is that the 80-tonner was a small ship - the smallest that the harbour authorities cared to use the facilities". In response to this Houston has commented that "the very issue of a decree limiting the inner harbour to large vessels, however, also shows that there were in fact many smaller ships, so many that they caused congestion, and that it was thought necessary to exclude them from the inner, protected harbour. Had there been no smaller ships, there would have been no need for any such regulation"; and he adds: "Perhaps it was thought that the smaller ships could more readily make do with the beach outside the protected inner harbour: the smaller the boat, the more easily it could be beached and drawn out to a position of safety". Houston seems to have overlooked that the regulation allows larger ships to be beached within the harbour; perhaps the difference was between slips (inside) and open beach (outside).[19]

Launey argued that in a period of known insecurity at sea (he refers to the pirates' attack on Samothrace between 288 and 281 BC)[20] the "closed port" of Thasos offered a welcome refuge, that "perhaps one did not want the shoreline of the port to be encumbered with too small ships", and that "this measure was taken in favour of more valuable ships"; "small ships could of course remain afloat

in the reserved areas and there was plenty of space in the "open port". Launey argued that we have here evidence of the value of *ellimenia* as income for a harbour city such as Thasos.

One must note that the regulation limits the hauling out of ships within specified parts of the port; Launey is right that it does not forbid the mooring of smaller ships. *Ellimenia* could no doubt be charged for mooring a ship, but less, one assumes, than for hauling it out; quay space for unloading cargoes does not seem to be involved.

Thirdly, what are the two areas specified? The key to the answer lies in the first line, which is damaged; Launey was not able to restore with confidence. Pouilloux provided the solution, reading ἐντὸς τῶν [ὅ]ρων, and referring to the horoi of ports such as Piraeus.[21]

Thus the regulation forbade the hauling out

1. of ships of less than (???) talents burden within the first *horos*;

2. of ships of less than 5.000 talents burden within the second *horos*.

What precisely is proposed? What are the first and second *horoi*? I can only argue as an outsider, and look for a response from those working on the ports of Thasos.[22] My assumption is that either the first *horos* is the entrance mark to an outer harbour, and the second *horos* is the entrance mark to an inner harbour; or the *horoi* are outer and inner marks within a single harbour. Though I have no proof, I assume it to be logical that "first" and "second" count from seawards.

If this is so, can we reach any firmer conclusion about the first numeral? At first sight one would expect the regulation to have encouraged larger vessels into the first (outer) harbour and medium-sized vessels into the second (inner) harbour, taking into account, for example, shallower depths there; in this case one has an argument for a larger numeral in the first clause, e. g. 7.000 talents. But perhaps Launey was right after all, that the Thasians were anxious to offer the best facilities to the richest cargoes, and encouraging the larger vessels into the inner harbour, or innermost parts of the harbour (even if, to be precise, the text deals with beaching rather than unloading). Modern practice would indicate the latter alternative.[23] Let us hope that the new work on the ports of Thasos will throw new light on this interesting document.

David Blackman

European Parliament Brussels

NOTES

1.   H. Hurst, *Lancaster in Italy and North Africa*, University of Lancaster 1981, 15-19, esp.16-17; cf. Hurst, "The Carthage Models", *Popular Archaeology*, May 1983, 24-27. I am grateful to Henry Hurst for these references. See also *CEDAC Carthage Bulletin*, 4, 1981, 24. My 1987 paper: *Tropis 2*, 1990, 35-52.

2.   H. Hurst, "Excavations at Carthage: fourth interim report", *Antiquaries Journal* 59.1, 1979, 24.

3.   I am grateful to Dr. I. Papachristodoulou, Ephor of theDodecanese, for giving me permission to visit the excavation site, and to his staff for arranging the visit.

4.   L. Basch, *Cahiers d'Histoire*, 33.3-4, 1988, 295 fig.8 (Naples Museum, No 8606). With the ship clearly on a slip the timbers can hardly be oars: cf. Basch, *Mariner's Mirror*, 65.4, 1979, 292-4 & figs 4-5 (No 8604), quoting earlier references.

5.   Dor: A. Raban & E. Linder, *IJNA* 7.3, 1978, 243; the slipways here are 30m in length, which may be taken as indicative of the length of the narrower group - not, however, at Rhodes where they were alongside a wider, and therefore longer group. Phalasarna: E. Hadjidaki, *AJA* 92, 1988, 477. Antikirrha: unpublished remains, visited by the Symposium participants in 1987. For smaller warships see L. Casson, *Ships and Seamanship in the Ancient World*, Princeton 1971, 123-35.b

6.   Mooney translated lines 371-7 as follows: "And quickly they hollowed out a trench in breadth as wide as the space the vessel encompassed, and extending in front of the prow into the sea itself as far as she was likely to run when pulled down by their hands. And the further they went, the deeper they kept digging down below the level of the keel, and in that furrow they laid smooth rollers, and on to the first of these rollers they tilted the vessel that she might glide down smoothly over them". The translation "rollers" conveys a slightly misleading impression.

7.   *Argonautica* 270-1, with the convincing emendation ταθείσης of F. Vian (*Les Argonautiques orphiques*, Budé 1987): it was enough to tauten one cable to set Argo in motion. Note here the use of cables in launching (as well as for hauling out): compare Horace, *Odes* 1.4.2 "trahuntque siccas machinae carinas".

8.   Pollux X 149: the other items are *holkoi* and *ouroi*, terms which deserve further analysis. Other references: Liddell-Scott-Jones s.v. Φαλάγγιον III.

9.   Callixenus *Peri Alexandreias* I (in Athenaeus V 204 c-d). See J.P. Oleson, *Greek and Roman Mechanical Water-lifting Devices: The History of a Technology*, Toronto 1984, 33; he suggests that one purpose was to allow access to the under part of the ship as it rested on the skids. Cf. J.G. Landels, *Engineering in the Ancient World*, London 1978, 163, who rightly argues against the traditional interpretation of the account, as referring to a slipway for construction and launching; N.A.F. Smith, "Roman Canals", *Transactions of the Newcomen Society*, 49, 1978, 83; Casson, op. cit. (n.5) 108-9, n.48.

10. Nonius Marcellus, 163.20ff.: "Phalangae dicuntur fustes teretes qui navibus subiciuntur quum attrahuntur ad pelagus vel quum ad litora subducuntur". *Phalangarii* were stevedores who carried e.g. amphorae slung on poles: J. Rougé discusses the evidence, *Recherches sur l'organisation du commerce maritime en Mediterranée sous l'empire romain*, Paris 1966, 180ff.

11. First published by J. Keil, *Ost. Jahreshefte* 44, 1959, 142-7. The reference to timber attracted the attention of R. Meiggs in his masterly work, *Trees and Timber in the Ancient Mediterranean World*, 1982, 358 & n.120. (with inexact reference). See now *Die Inschriften von Ephesos*, I (1979) no. 23.

12. A.A. Boyce, "The Harbour of Pompeiopolis: a study on Roman Imperial ports and dated coins", *AJA* 62, 1958, 67-78.

13. G.W. Houston, "Ports in Perspective: Some Comparative Materials on Roman Merchant Ships and Ports", *AJA*, 92, 1988, 563.

14. Quoted in Cicero, *De Inventione*, II 32, 98: "lex apud Rhodios est, ut, si qua rostrata in portu navis deprehensa sit, publicetur". I have heard rumours of an inscription found in Samothrace referring to ships and shipsheds, but know no details.

15. M. Launey, "Inscriptions de Thasos", *BCH*, 57, 1933, 394-410.

16. *IG* XII Suppl. 348. The line length (ca. 55 letters) is established by a legal formula in lines 6-7.

17. K. Hopkins, "Models, Ships and Staples", in *Trade and Famine in Classical Antiquity*, ed. P. Garnsey & C.R. Whitaker, *Cambridge Philol. Soc. Suppl.* Vol. 8, 1983, 84-109, esp. 99-100 & n. 34; Casson, op. cit. (n.5) 171 & n.23; 183. Casson had of course noted that "3.000" is a restoration, but found Launey's defence of it "completely convincing" ("The size of ancient merchant ships", *Studi A. Calderini e R. Paribeni*, 1956, I 234 & n. 12). He adds, however, that the only alternative would be 4.000, which we have seen is not correct; nor is his reference to the inscription as containing "a series of harbour regulations".

18. Cf. my 1987 discussion (*Tropis 2*, 1990, 45). If it was standard practice to haul merchant ships ashore in the winter months, this has not been recognised hitherto. A rabbinical source (D. Sperber, *Nautica Talmudica*, Leiden 1986, 77-80) apparently refers to slipping a merchant ship with cargo; cf. ibid. 80-82 for a possible reference to a launching windlass.

19. Houston, op. cit.(n.13) 559 & n. 32.

20. *IG* XII 8.150.

21. J. Pouilloux, *Recherches sur l'histoire et les cultes de Thasos*, I (1954) 394, n. 5, noting that Launey had been deceived into reading ἐν τοῖς by a vertical scratch on the stone; Piraeus *horoi*: *IG* I (2) 889-96.

22. See e.g. A. Archontidou-Argyri, A. Simossi & J.-Y. Empereur, "The underwater excavation at the ancient port of Thasos, Greece", *IJNA*, 18.1, 1989, 51-59.

23. Participants in the discussion stressed the modern practice of preventing small craft from cluttering up the best quays of a harbour.

On the use of the talent as a universal measure see H.T. Wallinga, "Nautika I. The unit of capacity for ancient ships", *Mnemosyne* 17 (1964) 1-40, esp. 11-12. He generally follows Casson, and is non-committal on the purpose of the two areas; he quotes Prof. Forbes as suggesting depth as a factor.

On the dangers of square brackets see E. Badian, "History from 'Square brackets'," *ZPE* 79 (1989) 59-70.