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Portus in its Mediterranean Context

by

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Abstract

This paper is a first tentative step in the relationship between Roman Mediterranean ports. In particular, it draws together evidence from the ports of Rome and two provincial ports. Hispalis (Seville) and Lepcis Magna were chosen for preliminary analysis since they were especially important to Rome as sources of large quantities of olive oil during the 2nd century AD. Attention is drawn to better understanding what current evidence for the improvement of infrastructure at the ports of Rome and in the provinces can tell us about (1) the increased commercial capacity of ports in the Mediterranean, (2) the degree of coordinated planning by the state, (3) the volume of shipping passing between ports, and (4) economic integration across the Mediterranean.

Introduction

Recent years have seen a major upsurge of interest in the Mediterranean ports of the Roman Empire, one focused primarily upon their location, development and character. The many other contributions to this volume make clear the impressive range and quality of archaeological and historical work now being undertaken in both the West and East Mediterranean.[1] This is a much welcome development that will help redress some of the imbalance in economic, social and cultural studies of the Roman Mediterranean, where major emphasis has been traditionally dominated by land-based evidence.[2] Despite this, however, there is still a need for a more "joined-up" approach to the study of ports, since it is precisely the relationships *between* ports, hinterlands, agricultural settlements and flows of trade that have most to teach us about their real significance within the economic and social life of the Roman Mediterranean. One welcome recent step in this direction, which arises perhaps as a long-term impact of Horden and Purcell's *Corrupting Sea* (2000) and their definition of the concept of connectivity, has been the interest in identifying and characterizing connections between ports.[3] Network analysis has been one of the more

[1] The publication of the recent conference *Harbors and Harbor Cities in the Eastern Mediterranean from Antiquity to Byzantium* (Istanbul 2011) is much awaited in this regard.
[2] Apart, of course, from the many studies of ceramics traded over long distances from land-based sites, and the distribution of shipwrecks.
[3] See also McCormick 2001.

significant methodological advances in ground-truthing some of these approaches[4] although this on its own is not enough. Another approach has been to recognize the value of, and methodological challenges inherent in, cross-linked analyses of similar classes of archaeological material from different port sites, as well as inter-port analyses of different kinds of material.[5]

Commercial and social relationships between the city of Rome and the ports of the Mediterranean during the Imperial period have been surprisingly understudied, even though inward flows of trade have a long history of research and many contingent ports have been the subject of important studies.[6] However, if one is to follow the logic of broad-brush arguments and characterizations of the Roman economy,[7] it is not difficult to see that much can be gained from a better understanding of the roles played by ports in mediating between the demands of the city of Rome, commercial flows across the Mediterranean as whole, and rhythms of regional agricultural production in key regions.

This is particularly true of the ports at, or close to, the mouth of the Tiber. Here, the early 2nd century AD represented a watershed in the development of infrastructure. The Emperor Trajan expended very substantial resources on the enhancement and integration of ports serving the capital, principally Portus, Ostia, Centumcellae (Civitavecchia) and the river port at Rome itself.[8] Other emperors followed his lead until at least the early 3rd century AD, consolidating and further enhancing infrastructure. The intention and, one guesses, the net effect of this, was to ensure that the city was better supplied with the large supplies of foodstuffs and material needed to sustain its population and its fabric. What is less clear is what the broader impact of these initiatives might have been upon other Mediterranean ports and their associated economic contexts. There has been much discussion of the broader issue of economic integration in recent years,[9] as well as of more specific studies on economic policy, monetization, commercial institutions, trade and markets.[10] The possible contribution of ports singly or collectively to this issue has not been much explored and much remains unclear. How far, for example, did the Roman state actively promote the development of pre-existing ports that were perceived as central to its interests? In the East Mediterranean at least, the port infrastructure of the Hellenistic kingdoms seems to have provided a solid basis for Roman needs, and required only limited intervention, while in the west, evidence for direct Roman

[4] Rathbone 2009 and Doukellis 2009 attempt network-informed analyses of East Mediterranean commercial institutions and communities; for a more holistic archaeological perspective see Brughmans 2010.
[5] Earl *et al.* 2012.
[6] Amongst many recent studies see for example Keay & Boetto 2010.
[7] This is truest of the "taxes and trade" model formulated by Hopkins (1980; 2002); see also more recent discussions, such as Morley 2007.
[8] This was supplemented by works at other Tyrrhenian ports as well as the development of a military port at Ancona on the Adriatic coast (Keay 2012c).
[9] Hopkins 1980 and Duncan-Jones 1990 amongst others.
[10] Bowman & Wilson (2009, 3–84) provide a useful summary of some of these studies.

intervention of one form or another is often clearer.[11] In those cases where Rome did actively promote the development of ports it is difficult to establish if this was the result of a conscious strategy or whether it reflected ad hoc decisions taken to meet perceived short-term needs at a regional, or even local level. It also needs to be asked whether there was a connection between increased port infrastructure at Rome and key Western Mediterranean ports and the geographical range of imported material? In other words, did the enhancement of infrastructure create greater commercial opportunities for provincial producers than had existed previously? One also ought not to ignore the possibility that the politics of display may have also played a part.

This paper, therefore, is a first tentative step in the exploration of these issues,[12] and draws together evidence from the ports of Rome and two provincial ports. Hispalis (Seville) and Lepcis Magna were chosen for preliminary analysis since they were especially important to Rome as sources of large quantities of olive oil during the 2nd century AD. In particular, attention is drawn to better understanding what current evidence for the improvement of infrastructure at the ports of Rome and in the provinces can tell us about (1) the increased commercial capacity of ports in the Mediterranean, (2) the degree of coordinated planning by the state, (3) the volume of shipping passing between ports, and (4) economic integration across the Mediterranean.

The demands of Rome

The large size of the population of Rome, the physical extent of the city, and the scale and range of imports from across the empire means that it is often understood as having been primarily a centre of consumption. It is well known that it had rapidly outgrown the ability of Italy alone to supply it during the Republic, and that imports from Sicily, Spain, Africa, Gaul and Egypt became progressively more important during the later Republic, and peaked under the early Empire.[13] By the 2nd century AD, the extent of the city had grown considerably since the Republic, and the population would have reached a figure in the order of up to *c*. 1 million,[14] representing a major challenge to the authorities and individuals charged with ensuring that

[11] Most obviously at the ports of Rome. Even so, the topography and harbour technology of a number of western ports still owed much to a blend of earlier traditions and Roman innovations—as at Carthage (Hurst 2010), Gades (Bernal Casasola 2010) or Marseille (Hesnard 2004) for example.

[12] It arises from a project led by the author that aims to better understand the relationship between Portus, Rome and the Mediterranean. The *Portus Project* (2007–2014) is financed by the Arts and Humanities Research Council of the UK, and is undertaken by the University of Southampton in collaboration with the British School at Rome, the University of Cambridge and the *Soprintendenza Speciale per i Beni Archeologici di Roma* (*Sede di Ostia*) and other UK and European research institutions (www.portusproject.org).

[13] Rickman (1980, 26–93) provides an overview of the evidence for grain.

[14] Morley 1996, 33–54. Others, for example Lo Cascio 2001, favour a lower figure.

it was adequately supplied.[15] The successive reorganizations of the grain supply under Augustus, Claudius and Trajan[16] are symptomatic of the state's response, while assemblages of amphorae from excavated 1st- and 2nd-century AD deposits[17] in the city illustrate the range of sources supplying the more archaeologically visible foodstuffs. At the same time, successive major building programmes under the Flavians, Trajan, Hadrian, the Antonines and the Severans[18] monumentalized much of the centre, ensuring that there was an ever greater demand for building materials, which was met locally and from sources across the Mediterranean basin.

Any account of the needs of Rome also has to take account of its hinterland, or suburbium. Work by Morley[19] has already stressed the importance of the economic relationship between the city and its hinterland; new archaeological work undertaken since then has vindicated this, both in areas closer to Rome,[20] and in the Tiber Valley further to the north,[21] leading Witcher to argue that conceptually at least we should consider the suburbium to have encompassed a far greater area than is traditionally assumed.[22] While many of the communities within the suburbium would have been self-sufficient, growing economic prosperity during the Early Imperial period coupled with emulative strategies by towns and inhabitants of the wealthier villas generated needs for key commodities from across the Mediterranean. These included marble, fine and coarse tablewares, and imported foodstuffs that would have been imported from Rome, but which would have originated at the maritime ports of Portus, Ostia and Centumcellae, amongst others. This model assumes that Rome was a centre for the inward re-distribution and export of Mediterranean goods. It played a similar role outwards to the Mediterranean at large, with construction material, millstones and wine, amongst other commodities, being transported down the Tiber Valley to Rome through the river port at Ocriculum (Otricoli), as well as from areas closer to hand. The success of this role was underpinned by the river port at Rome and its relationship to the maritime ports at the mouth of the Tiber.[23]

The "port system" of imperial Rome (*Fig. 1*)

The 2nd century AD saw Rome being served by the river port within the city itself, as well as Ostia, Portus, Centumcellae and Puteoli (Pozzuoli), with Antium (Anzio) and Tarracina (Terracina) playing lesser roles. It is the contention of this paper that at least the first four of these should be

[15] Morley 2007, 576–578. Guidobaldi (2000) provides a good general account of one archaeological correlate for this in the spread of residential housing in the city down to the Late Antique period.
[16] Rickman 1980.
[17] Rizzo 2003.
[18] Respectively Coarelli 2009; Bennett 1997, 148–160; Palombi 2012; Boatwright 1987; Thomas 2007; Gorrie 1997.
[19] Morley 1996.
[20] Pergola, Santangeli Valenzani &Volpe 2003; Jolivet *et al.* 2009.
[21] Patterson 2004; Coarelli & Patterson 2008.
[22] Witcher 2005.
[23] Discussed in more detail in Keay 2012c.

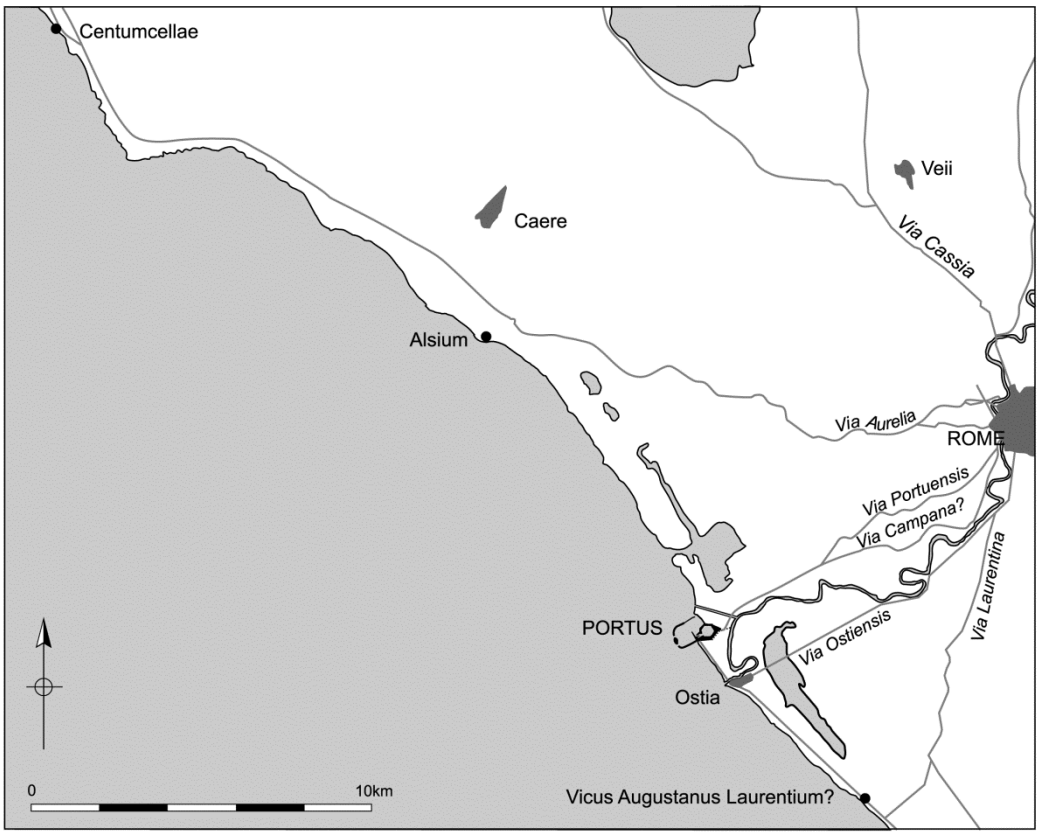

Fig. 1. Map showing relationship between Rome, Ostia, Portus and Centumcellae (P. Copeland).

understood as key nodes in what could be understood as a "poly-focal hub" or "port system". The term "system" is used here to loosely describe the close inter-relationships and connections between all four ports.

Prior to the reign of Trajan, Rome had relied upon a series of arrangements that had developed over time. Puteoli (Pozzuoli) had been the principal maritime port for ships from across the Mediterranean from the 2nd century BC, particularly for those from the east.[24] Cargoes were stored in ample warehouses at the port before being shipped up the coast in smaller ships and boats. Once they reached the mouth of the Tiber they passed through the river port at Ostia, before moving up river to the emporium and Portus Tiberinus at Rome. While this arrangement clearly worked, Puteoli lay a long way to the south and cargoes had to be transshipped into smaller coastal craft before heading north. Once these arrived at Ostia they would have been berthed along the sea-front, with the *c*. 2-ha harbour basin, or along the *c*. 1.3 km of quays along the Tiber, before moving up river to Rome (*Fig. 2*).[25] Thus, by the early 1st century AD, arrangements for supplying Rome were logistically complex and did not allow for cargoes to be delivered with the speed and regularity needed to meet Rome's burgeoning demands. Claudius' establishment of the artificial deep-water

[24] De Romanis 1993.
[25] Discussed in more detail in Keay 2012c, 41–44.

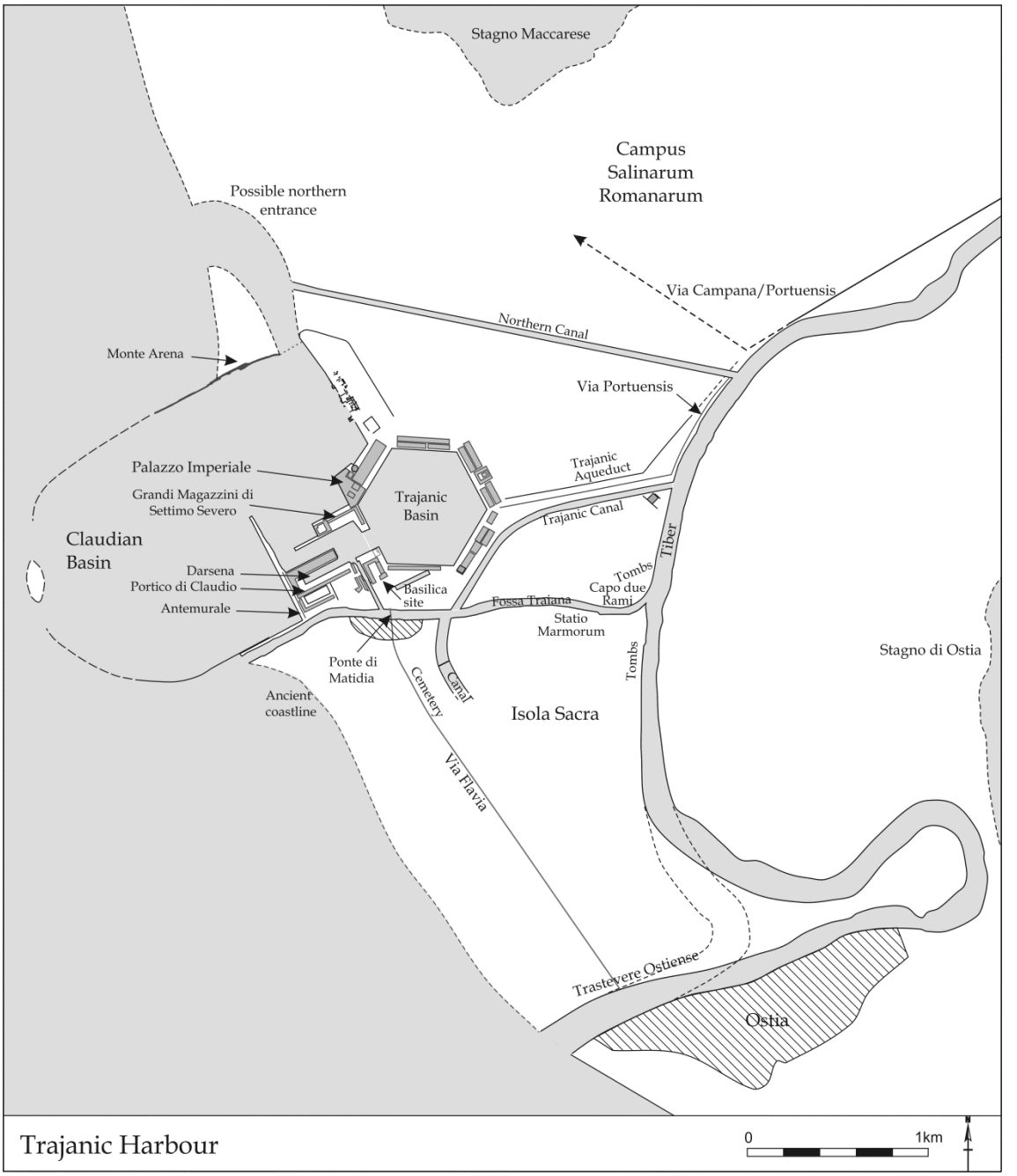

Fig. 2. Map showing the Portus, Ostia, and other elements of the port system (P. Copeland).

harbour at Portus needs to be seen against this background.[26] It can be interpreted as an attempt to reinforce the role of Ostia as a holding place for cargoes coming up the coast from Puteoli, which continued to play an

[26] Discussed in Keay *et al*. 2005, 297–305. Notwithstanding the small size of the harbour basin at Ostia, it may be no coincidence that, as recent geo-archaeological work by J. P. Goiran has demonstrated, it was abandoned at some time between the 2nd century BC and the first quarter of the 1st century AD, at which time it was only *c*. 1 m deep (http://www2.cnrs.fr/en/2143.htm: last consulted 30/11/13).

important role in supplying Rome until some time in the course of the later 2nd or even-earlier 3rd century AD.[27] In this way, the Roman authorities had begun to work towards developing an administratively easier and more rapid arrangement for supplying the capital. Claudius' initiative comprised the construction of a massive artificial anchorage 3 km to the north of Ostia. It encompassed *c*. 200 ha with a depth of *c*. 5 m, and partnered a lesser *c*. 2-ha basin (Darsena) and massive warehouse (Foro Olitorio), as well as some kind of embryonic river port close to the Tiber.[28] The basins were connected to both the Tiber and the sea by two canals,[29] and to Ostia in the south by a road in the later 1st century AD at the latest. The complex was inaugurated by the Emperor Nero in AD 64 and continued to develop in the course of the later 1st century AD, with the establishment of the *statio marmorum* and a small settlement on the north side of the Isola Sacra immediately to the south of Portus in the late 1st century AD.[30]

The reign of the Emperor Trajan (AD 98–117) ushered in a period of *c*. 100 years during which supply to Rome was gradually transformed by a closer integration of existing ports as well as an increase in their capacities. Puteoli, by contrast, came to play an increasingly regional role. In the first instance, the river embankment in the lower lying areas of the river port at Rome was raised in the first years of the 2nd century AD to protect port facilities when the Tiber was in flood. This was followed by the construction of riverside storerooms and offices in the emporium between AD 105 and 123,[31] as well as large warehouses set further back from the Tiber, most notably in the Portus Tiberinus at some time after AD 105; another major warehouse was built in the emporium under the reign of Hadrian (*Fig. 3*).[32]

A second project involved the enlargement of pre-existing facilities at Portus between *c*. AD 110 and 117 (*Fig. 4*). Its principal feature was a new 32-ha hexagonal basin that was *c*. 5 m deep and lay immediately to the east of the Claudian basin. This meant that the port now offered a maximum of *c*. 234 ha of deep-water anchorage space for large seagoing ships together with a maximum of *c*. 13.89 km of quay space (*Fig. 5*).[33] Not enough is yet known about the use of any of the basins or of the canals that connected them to the Tiber to enable meaningful calculations about the number of ships and boats that might have used the port complex as a whole.[34] The movement of this traffic, however, was coordinated from a building known today as the "Palazzo Imperiale" that overlooked both basins at the centre of the port. The large and enigmatic building immediately abutting it to the east

[27] Keay 2010.
[28] For recent work on the Claudian port, see Morelli, Marinucci & Arnoldus-Huyzenveld 2011.
[29] These canals also played an important role in helping ease the level of the Tiber during floods, with a view to easing the threat of flooding at Rome (Keay *et al*. 2005, 298).
[30] Discussed in Keay 2012c, 47.
[31] Mocchegiani Carpano 1984; 1985.
[32] At the Nuovo Mercato Testaccio at the foot of Monte Testaccio (Sebastiani & Serlorenzi 2008); for a broader discussion of this and aspects of the port of Rome, see Keay 2012c, 37–39.
[33] The calculations for this are provided in Keay 2012c, 44–46.
[34] See, however, Boetto 2010 for a first attempt at relating the depth of basins and canals to known ship sizes.

may have been associated with ship building or repair activities of some kind (*Fig. 6*).[35] Portus was also equipped with new warehouses, with recent estimates suggesting that capacity increased from 32,790 m^2 in the pre-Trajanic period, to 92,278 m^2 under Trajan.[36] These figures assume that many of the buildings that border the hexagonal basin were warehouses of Trajanic date. However, recent research underlines how little is known of their development, and suggests that the establishment of warehouses at Portus was a more gradual process that began under Trajan, but continued through the later 2nd century into the 3rd century and beyond. What evidence we have so far points to the existence of warehouses on only two of its six sides in the earlier 2nd century AD. The first was on the south-eastern side of the basin,[37] where *magazzini* of the 2nd century AD stored grain that was transshipped onto lighters for transport to Rome by canal and the Tiber. Secondly, a temple and temenos dominated the middle of the north-eastern side,[38] flanked on each side by long buildings that one can probably assume were warehouses, but are of uncertain date. The north-western side[39] was dominated by the "Palazzo Imperiale" and the adjacent enigmatic building,

Fig. 3. Photo of the Hadrianic warehouse at Nuovo Mercato Testaccio (photo provided courtesy of Renato Sebastiani).

[35] Keay *et al*. 2012.
[36] Keay *et al*. 2005, table 9:1. Although this will have to be revised in view of the recent discovery that in its primary phase the building adjacent to the Palazzo Imperiale was not a warehouse, and new w ork at the *Magazzini Traianei* (Boetto *et al*. 2010).
[37] Keay *et al*. 2005, Area 11.
[38] Keay *et al*. 2005, Area 12.
[39] Keay *et al*. 2005, Areas 8 and 9.

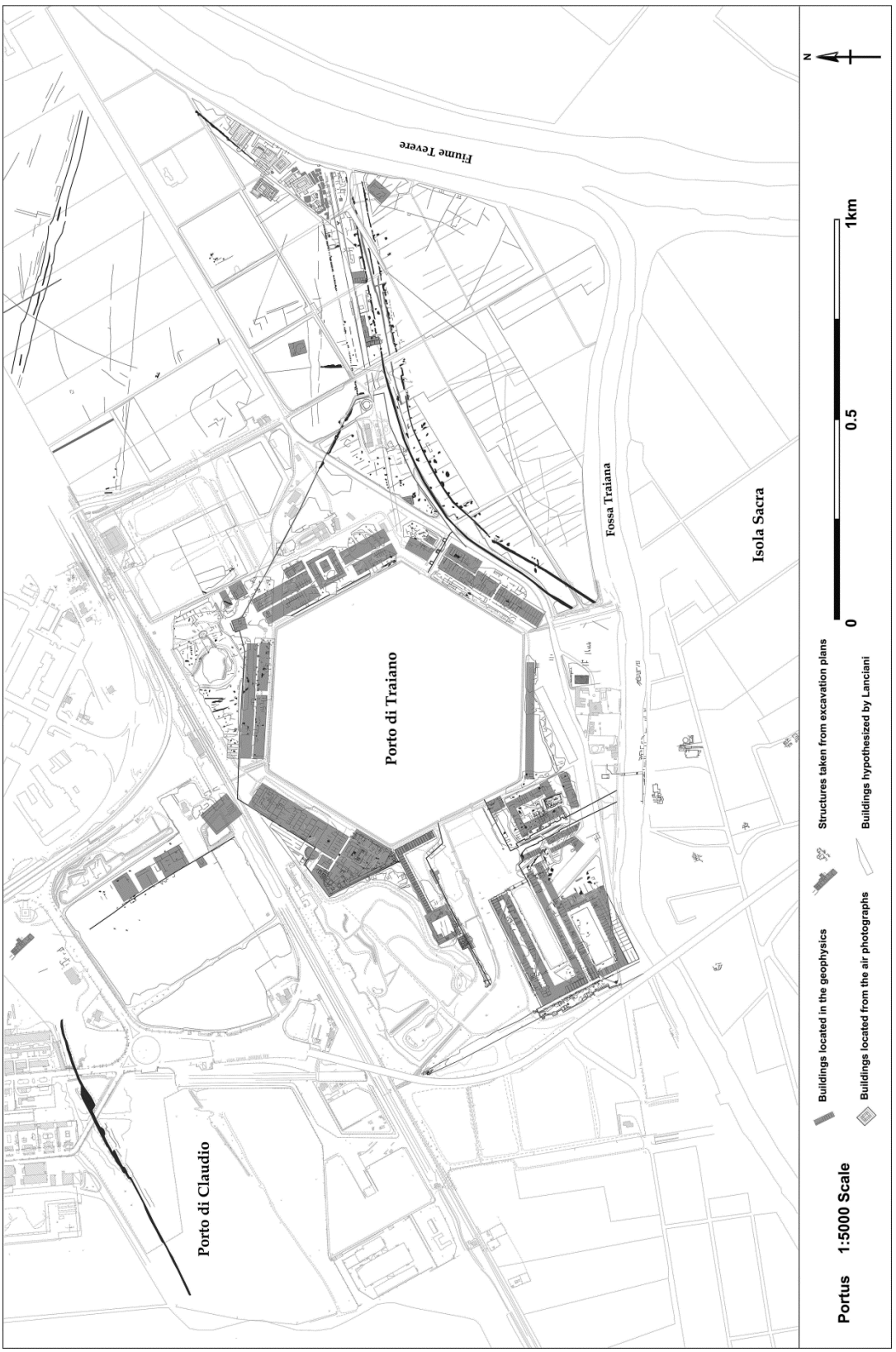

Fig. 4. Plan of Portus (after Keay *et al*. 2005, pull out 2).

Fig. 5. Aerial photo of the Trajanic basin at Portus (S. Keay)

Fig. 6. Reconstruction of the Trajanic *navalia* at Portus (Portus Project).

neither of which were intended for storage.[40] The south-western side, by contrast, is pierced by the entrance to the basin from the *Canale di imbocco al porto di Traiano*. Nothing is known of the northern side prior to the later 2nd century, while to the south lies the *Scalo all'Imboccatura del Porto*[41] a small building of unknown function and date. At present nothing is known of the nature of the buildings that would have lined the southern and northern sides of the hexagonal basin.[42] Away from the basin, the Trajanic and subsequent periods saw the construction of a massive complex of

[40] Keay, Earl & Felici 2011; Keay *et al*. 2012, 503–510.
[41] Keay *et al*. 2005, Area 6.
[42] Keay *et al*. 2005, Areas 10 (southern) and 14 (northern).

warehouses in the area centred upon the Darsena and lying between the Canale di Imbocco al Porto di Traiano to the north, the harbour frontage to the west, and the Fossa Traiana to the south: recent research suggests that they were used largely for the storage of grain.[43]

However, these developments represent a first stage in what was probably a continuous sequence of building work that took place during the reigns of Hadrian and the Antonines. These are clearest at the centre of the port, with the conversion of the large building adjacent to the "Palazzo Imperiale" into a massive warehouse complex[44] and the construction of the Grandi Magazzini di Settimio Severo during the later 2nd century AD (*Fig. 7*). There were further important changes between the end of the 2nd century and the early 3rd century AD, particularly when the "Palazzo Imperiale" was enlarged and structurally united with the adjacent Grandi Magazzini di Settimio Severo,[45] and there were major developments at the Magazzini Traianei.[46] Overall, therefore, the provision of warehouse space must have risen to well over 145,072 m^2 by the early 3rd century AD.[47]

Fig. 7. Photo of the Grandi Magazzini di Settimio Severo at Portus (Portus Project).

While these developments provided Portus with an ever-greater capacity for storage than it had enjoyed previously, others promoted a more direct movement of cargoes and people between the port, the Tiber and Rome. A canal that was dug between the Fossa Traiana and the river Tiber to the east ran parallel to the warehouses on the south-eastern side of the hexagonal basin.[48] This enabled cargoes from seagoing ships that had been unloaded

[43] Boetto *et al.* 2010; see also Lugli & Filibeck 1935, 116–121.
[44] Keay *et al.* 2012.
[45] Keay, Earl & Felici 2011.
[46] Boetto *et al.* 2010.
[47] Keay *et al.* 2005, fig. 9:1.
[48] Keay *et al.* 2005, Area 11.

and stored to be transshipped onto lighters that could then move them up to Rome by the canal and the river.[49] Furthermore, the Via Campana/Portuensis was now extended as far as Portus and, as it approached the port, ran parallel to this canal. A second and even more substantial canal ran southwards from Portus across the Isola Sacra towards Ostia, and one imagines that this may have been established in part to speed up the movement of cargoes between Portus and Ostia.[50]

A third development involved an increase in warehouse space at Ostia, rising from 17,667 m^2 in the 1st century, to 31,882 m^2 in the 2nd, and 46,118m^2 in the later 2nd century AD.[51] Most of the earlier 2nd-century AD warehouses were built in the area between the Decumanus Maximus and the Tiber (*Fig. 8*) between AD 112 and 115[52] late in the reign of Trajan and during the early years of Hadrian.[53] The development of these, and indeed other buildings, has been interpreted as a consequence of the enlargement of Portus under Trajan and subsequent developments by his successors.[54] While it is tempting to interpret these as simply an attempt by the municipal authorities to provide additional warehousing for supplies destined for Rome, an alternative might be to see them as also being used to hold supplies imported to Ostia from Portus in order to feed its burgeoning

Fig. 8. Aerial photo of Ostia (S. Keay).

[49] Keay *et al*. 2005, 309–310.
[50] Germoni *et al*. 2011.
[51] Keay *et al*. 2005, table 9:1.
[52] Mar 2002, 153.
[53] See Delaine 2002 for the chronology of the brick stamps from these buildings.
[54] Rickman 2002, 355–356; Mar 2002, 144–148.

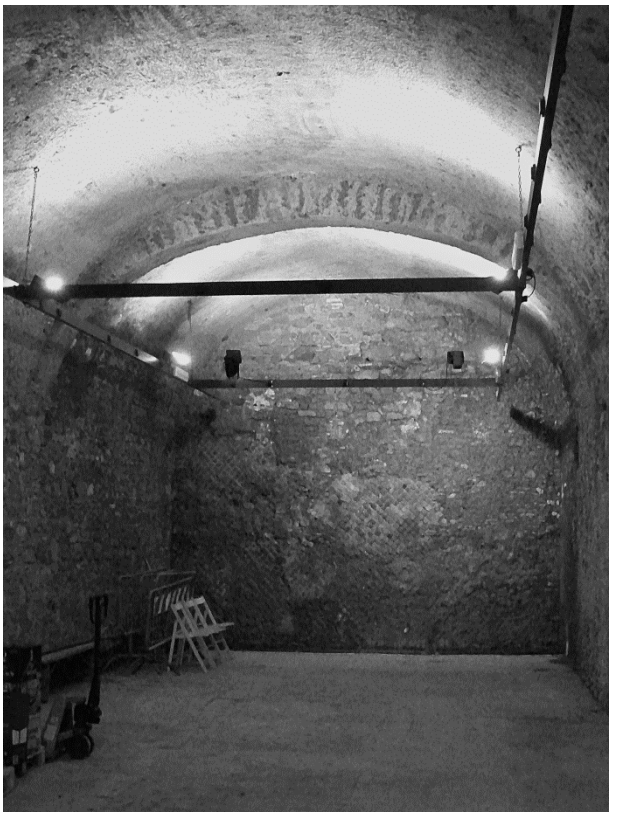

Fig. 9. Photo of one of the warehouses at Centumcellae (S. Keay).

population. In either case, the increase in warehousing space reflects a growing integration of the economic fortunes of Ostia, Portus and Rome.

A fourth and final Trajanic initiative involved the establishment of a massive new artificial port at Centumcellae, some 60 km to the north of Rome on the Via Aurelia, between AD 106 and 110.[55] This consisted of an inner and outer basin (14 ha), whose depths in the Roman period are unknown, as well as at least two warehouses—one bordering the inner basin and another adjacent to the outer basin (*Fig. 9*). None are as yet known from the substantial urban settlement.[56]

It would seem hard to argue against the Trajanic initiatives at Rome, Centumcellae and Portus being the result of integrated strategic planning by the emperor and his advisors, who would have been able to finance the building by drawing upon the gold from Dacian gold mines following the conquest of Dacia (AD 101–106). The comments in Pliny's letter to Cornelianus (*Epistulae* 6.31), for example, make it clear that Trajan himself was the driving force behind this project, while the commemorative coin issue of AD 112/114[57] that announces his works as the *Portum Traiani* suggests the same. Realizing all of these projects between AD 106 and 117, however, must surely have involved coordination between imperial procurators, *the curatores alvei tiberis et riparum et cloacarum Urbis* and

[55] Quilici 1993 provides a useful summary of the port.
[56] Toti 1992, plan.
[57] Keay *et al*. 2012, 504.

the *praefectus annonae*.[58] They would also have presumably liaised with agents of the *annona* and port authorities at Puteoli, which still played a role in supplying Rome at this time, as well as local officials responsible for administering lesser ports along the Tyrrhenian coast to the south of the Tiber mouth. Further integrated planning at the ports of Rome later in the course of the 2nd century AD is an issue that is less well understood at present.

The inter-relationships between all four of these ports suggest that they functioned as an integrated "port system" within which each centre exercized a range of complementary roles. Portus, with its capability for receiving ships of all sizes, acted as the re-distributive hub for cargoes to the river ports of Ostia and Rome, thereby ensuring that their roles became complementary. Ostia acted primarily as a centre of administration and population that supported the harbour-oriented role of Portus, while the facilities at Rome were further enhanced to receive the increased volume of merchandise from overseas and the Tiber valley, and to re-distribute this within the capital and beyond.

An initial consideration of the transformation of harbour facilities at Portus and Centumcellae during the 2nd century suggests that there was a major initial boost in capacity under Trajan, with further increases following down to the early 3rd century AD. In particular, their deep-water capability ensured that they were able to receive the largest ships of well over 400 tons plying trade routes across the Mediterranean, as well as crafts of lesser size.[59] These developments must have helped confirm Portus, Ostia, Centumcellae and Rome as the pre-dominant commercial hub in the Mediterranean—with major implications for provincial ports. Together they dwarfed provision at other major West Mediterranean ports in the West Mediterranean, such as Carthage, Gades, Tarraco and Massallia. The only real parallel in terms of scale was the Alexandria-Mareotis complex,[60] although it needs to be remembered that the primary mission of this under the early Empire was export, while that of the port system of Rome was primarily import.[61]

One imagines that one of the implications of these developments was that the volume of commercial traffic across the Mediterranean would have been boosted. However, this is difficult to measure. The most direct method would be to calculate the number of ships and boats that now entered the port system and make a comparison with figures for Ostia, Puteoli and Portus in the 1st century AD. But there are currently too many variables and lacunae in our understanding of how any of these ports functioned to make this worthwhile.[62] Another approach is to analyze the data from Mediterranean shipwrecks with a view to gauging whether there was an increase during the period of the 2nd century AD. This increase might be

[58] Keay 2012c, 54–55.
[59] The sizes of Roman ships are discussed by Wilson 2011.
[60] Khalil 2010.
[61] Keay 2012b, 4.
[62] There have been various attempts to gauge this by calculating the number of ships and boats that might have used the port in the 2nd century AD: Brandt 2005 is one of the more recent of these.

taken as an index of a growing volume of maritime traffic that might reasonably be explained as arising from the development of port infrastructure at Portus and Centumcellae. Recent re-analysis[63] of the data originally published by Parker,[64] however, suggests that the "centre of gravity" in the chronological distribution of wrecks was the 1st rather than the 2nd century AD. There are many reasons, however, why this may provide a misleading impression of the overall trend in the volume of maritime traffic. It is entirely possible, for example, that simply treating all wrecks the same might mask the fact that while the numbers of ships in the 2nd century were the same or less than before, a higher proportion of them might have been of a much greater tonnage than before, in the region of *c*. 400 tons and above, taking advantage of the deep-water basins offered by Portus, and presumably Centumcellae. In this way, although the numbers of ships might have remained roughly constant, the volume of cargo coming into the ports might have been greater than in previous periods. Alternatively, the lack of archaeological visibility of grain sacks on wrecks might have led to an under-representation of these in favour of those that carried more visible amphorae.[65]

Interpretation of the evidence for traded goods presents similar interpretative difficulties. One of the most important commodities, grain, leaves very little archaeological trace. Our understanding of it, therefore, is almost entirely based upon indirect information passed on to us by the Classical sources, and it is impossible to get any sense of whether there was an increase in supplies to Rome during the course of the 2nd century. One of the few directly relevant comments refers to the Emperor Commodus creating the African grain fleet (*commodiana herculeana*) that was to be held in reserve if the Alexandrian grain supply should happen to fail (SHA *Commodus* 16.9). Of all the archaeological evidence at our disposal, ceramics and marble are the best known and the most abundant. However, the characterization of many varieties of the former, particularly the white varieties, is not straightforward, while quantification of material from port sites is rare, with techniques varying from one site to the next. Nevertheless, the extensive building programmes at Rome during the 2nd century, particularly under Hadrian and the Severans,[66] suggest that large-scale import to the ports of Rome was at least maintained.

Ceramics, therefore, remain the most accessible source of evidence for gauging the volume of commerce centred at the ports of Rome. Of the many varieties that survive in the archaeological record, amphorae remain the most appropriate material[67] since they were manufactured to carry foodstuffs over long distances and were transported primarily for their contents. However, published deposits of appropriate dates from the port sites are rare, and those

[63] Wilson 2009.
[64] Parker 1992.
[65] Wilson 2009, 226–228.
[66] Boatwright 1987; Gorrie 1997.
[67] There has been an attempt to calculate changing volumes of African Red Slip Ware, (Fentress *et al*. 2004) which has been used as a proxy indicator of economic growth, while Bonifay & Tchernia (2012) have argued that the distribution of some varieties of African ceramics can be taken to reflect archaeologically invisible material, such as grain.

that do exist are fairly small and do not readily lend themselves to quantitative analysis. At Portus there are just a handful of small unpublished Trajanic deposits from the "Palazzo Imperiale" and the adjacent building, while excavations at the Basilica Portuense revealed a deposit of only 109 sherds of pottery from the Period IB (AD 80/90–120).[68] The nearest deposit in time at Ostia dates to the Antonine period,[69] while from the emporium at Rome there is a Hadrianic deposit from the recent excavations at the Nuovo Mercato di Testaccio.[70] The Severan period is slightly better served, with some substantial published deposits from the "Palazzo Imperiale" and the Basilica Portuense at Portus,[71] but none at either Ostia or the emporium at Rome. None of the material from Centumcellae has yet been published. There would also be a need for earlier and later deposits against which to chart the quantity of Trajanic or Severan material in circulation. Lastly, the proportion of material from each deposit would have to be scaled proportional to site area to ensure that deposits from different sites were readily comparable. In short, it is simply not yet possible to use ceramics to calculate the volume of commerce passing through Portus in the course of the 2nd century AD.

On the other hand, there is evidence from Ostia and Rome that suggests that the transition from the 1st to the 2nd century AD saw an increase in the *range* of overseas imports at the expense of products from Italy.[72] By the later 2nd century AD Ostia and Portus[73] were importing amphorae and other ceramics from Baetica, Tarraconensis, Gallia Narbonensis, the Tyrrhenian and Adriatic coasts of Italy, Africa Byzacena, Tripolitania, Cos, Crete, Cnidos and Asia Minor etc., consolidating their roles as key nodes within the integrated commercial networks that criss-crossed the whole of the Mediterranean. While this kind of evidence is often ascribed to a collapse in Italian production and increasing provincial competition, an alternative might be to see it as a greater diversification in supply arising from the opportunities offered by the enhanced port facilities at Portus, Centumcellae and Ostia. This in turn would reflect an increased degree of economic integration across the Mediterranean basin.

It is clear, however, that West Mediterranean sources predominated at both ports. Baetica was the most important of these, supplying large quantities of olive oil, and to a lesser extent, fish sauce from the 1st until *c*. the mid-3rd century AD. Recent finds from excavations at Monte Testaccio are a good index of this, so far allowing us to better understand the volume and aspects of the mechanics of supply of both commodities for the period between the mid-2nd and mid-3rd centuries AD.[74] They also show that

[68] Di Giuseppe 2011.
[69] Rizzo 2012.
[70] Sebastiani & Serlorenzi 2008.
[71] Zampini 2011 and Di Giuseppe 2011.
[72] For Ostia, see Panella & Tchernia 2002 for a summary of the material from key sequences in the Terme del Nuotatore and more recently, Martin 2008, 107–111; Sebastiani & Serlorenzi 2008.
[73] Rizzo 2012 and Di Giuseppe 2011.
[74] Blázquez Martínez, Remesal Rodríguez & Rodríguez Almeida 1994; Blázquez Martínez & Remesal Rodríguez 1999; 2001; 2003; 2007; 2010. Excavations have yet to reach earlier 2nd- and 1st-century AD levels.

Africa Byzacena and Tripolitania (for olive oil and fish sauce) were key suppliers from the later 2nd century AD onwards. There is a surge in the proportion of imports from the latter in the early 3rd century,[75] which is a phenomenon also noted at Portus, but which is different to the totals noted at Ostia;[76] there is then a surge in the proportion of African material by the middle of the 3rd century AD.[77] By contrast, the evidence for marble imports suggests that supplies were dominated with material from the Eastern Mediterranean since this is where the majority of the quarries were located—even though material from African quarries is also present at both the ports[78] and at Rome.[79]

Overall, this kind of evidence points towards a high degree of economic integration. The nature of the networks that supplied foodstuffs to Rome in this way, however, was highly complex and is not well understood. It is all too easy to think of the networks in terms of major trade routes linking the ports of the Mediterranean directly with Portus and Ostia in particular, while the reality may have been more complex, with agricultural surplus making its way by means of indirect capillary movements between minor ports to major re-distributive centres such as Carthage and Gades (Cádiz) before being loaded onto ships heading towards Italy. However, the rarity of well-recorded associations of ceramics and marble of known origin from different parts of the Mediterranean on wrecks makes it difficult to trace these movements.[80]

Provincial port developments

There are thus grounds to suggest that 2nd-century AD developments at Portus, Centumcellae, Ostia and Rome are best understood in the context of a Mediterranean basin whose diverse regional economies were well integrated and focused to some degree upon the demands of Rome. Consequently, one might expect to see related developments at key provincial ports that enjoyed a close commercial relationship with Rome. This part of the paper is an attempt to explore this issue with the evidence from two reasonably well-documented ports that were key trading partners with Portus during the 2nd century AD, namely Hispalis (Seville) in Baetica and Lepcis Magna in Tripolitania. In particular, it briefly reviews evidence for the development of port infrastructure, agricultural production in the hinterland of the ports, and the commercialization of their surplus production as reflected in the production of amphorae.

[75] Blázquez Martínez & Remesal Rodríguez 2001.
[76] Rizzo 2012.
[77] Blázquez Martínez & Remesal Rodríguez 2007.
[78] See most recently Pensabene 2007.
[79] Maischberger 1997.
[80] Discussed in various papers in Keay 2012a.

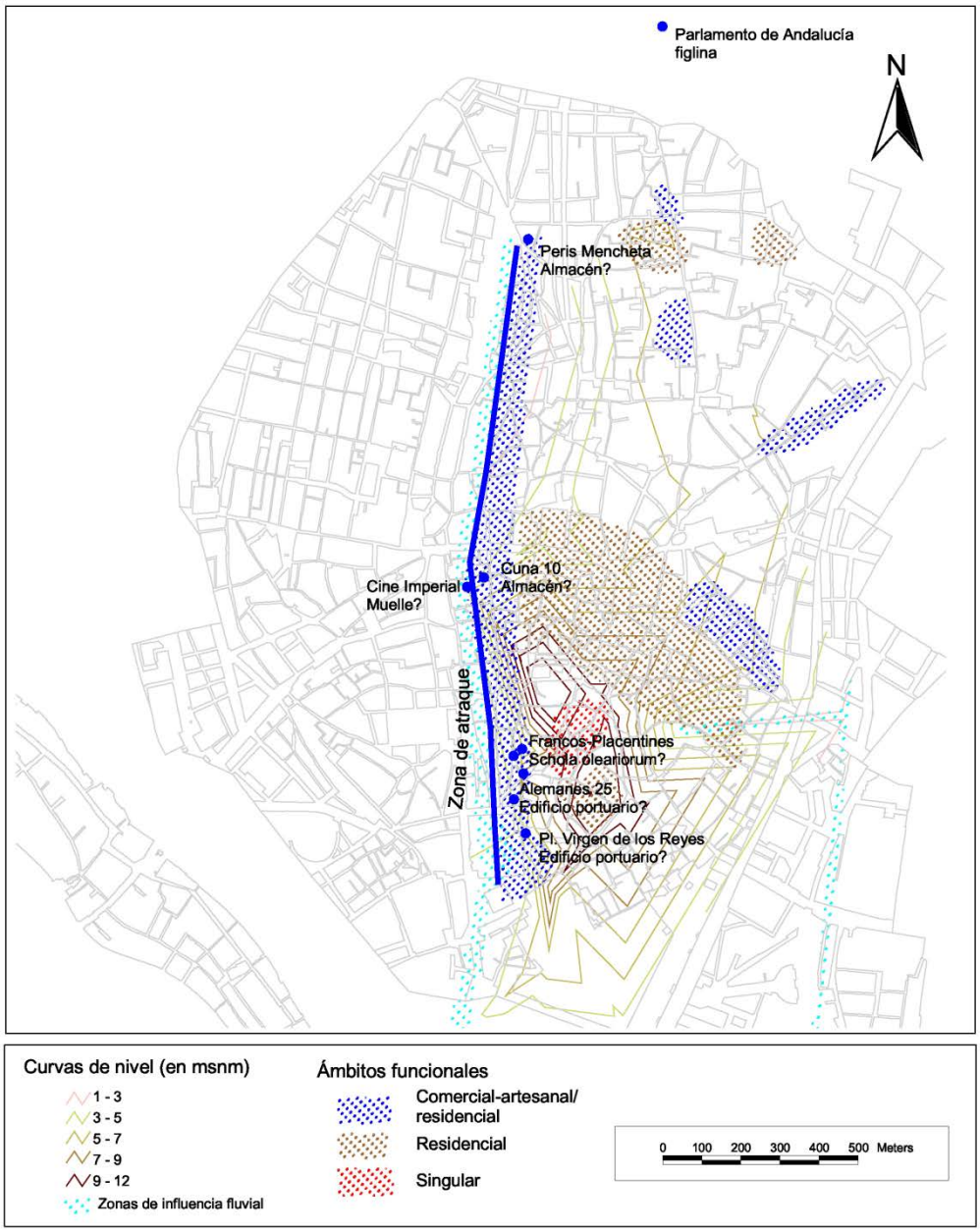

Fig. 10. Plan of the river port at Hispalis (after González Acuña 2010, fig. 27).

Hispalis (Seville) was one of the most important maritime ports of that in Baetica. It was located at a key crossing of the river Guadalquivir, a short distance to the north of the two minor ports of Orippo (Torre de los Herberos) and Caura (Coria del Rio). These were situated at the junction of the Guadalquivir and the Lacus Ligustinus, a very extensive internal lagoon antiquity provided direct access to the Atlantic to the north of Gades (Cádiz), and which corresponds to the Marismas today. Following the elevation of Hispalis to colonial status under Caesar, the Via Augusta was routed through the town on its way from Corduba (Córdoba) down to the Portus Gaditanus (Puerto de Santa María). This helped transform the colony into a major

regional communications hub for south-western Baetica from Augustus on into the Late Antique period, so that it acted as a conduit for the movement of key commodities between the Guadalquivir valley, Rome and different parts of the Mediterranean. Metals from the Sierra Morena mountains and olive oil from what are now the vegas of Seville and Córdoba were particularly important. Hispalis also acted as a centre for the transshipment of gold bound for Rome from the mines of northern Tarraconensis, which arrived at the port by virtue of the Via de la Plata from the region of Asturica Augusta (Astorga).

There is very little doubt that Hispalis was already an important commercial centre by the later 1st century BC.[81] It was located on the eastern bank of the Guadalquivir river close to a junction with the Tagarete tributary; in antiquity the former was marginally set back from its modern course and ran along the line of the modern Avenida de la Constitución (*Fig. 10*).[82] The comprehensive re-development of the area during the Islamic domination of the city means that much of the layout and development of the Roman port is obscured by later buildings. However, a combination of archaeological, epigraphic and historical evidence suggests that the main focus of port installations may have been in the south of the town. The area of the later Los Reales Alcazares de los Reyes and the Cathedral was particularly important,[83] while landing stages and warehouses have also been documented along the entire length of the east bank of the Roman riverfront as far north as the Plaza de la Encarnación, a distance of *c*. 1.5 km. This is comparable to the length of the riverfront at Ostia, although the fragmentary nature of the archaeological record in Seville does not allow us to get any idea of the density of port infrastructure. Furthermore, nothing is known of possible port installations on the west bank of the river. What evidence there is suggests that the period between the later 1st and the early to mid-2nd century AD witnessed an important stage in its development, which was bound up with a concentration of its activities upon the transshipment and export of olive oil to Rome.[84] In the Patio de las Banderas on the northern side of the Reales Alcazares, for example, recent excavations have uncovered the remains of a large building, possibly a warehouse, of 1st-century BC date, built from *opus africanum*; this was rebuilt as a two-naved structure on a more substantial scale in the late 1st or early 2nd century AD, when the floor levels were raised by *c*. 2 m and new floors were added.[85] The area between the Reales Alcazares and the cathedral has produced a number of key 2nd-century AD inscriptions commemorating officials involved in the administration of the export of olive oil to Rome,[86] traditionally prompting speculation that this area may have been the site of

[81] González Acuña 2011 is a good introduction to the development of the town.
[82] González Acuña 2010. Little is known of the depth of the Roman riverbed and, thus, the size of the ships that Hispalis could have accommodated. However, it is likely that they would have been in the upper part of the size range for Roman ships. Paintings and engravings of the 15th and 16th centuries AD show the river between the Arenal and Triana crowded with large galleons returning from the Indies.
[83] González Acuña 2010.
[84] González Acuña 2010, 103–104; 2011, 409–436.
[85] Tabales Rodríguez 2010; 2012, 933–936.
[86] Such as most recently Chic García *et al*. 2001.

associated buildings. However, the recent discovery of an inscription mentioning *olearii* in the vicinity of the Reales Alcazares has prompted the suggestion that a large warehouse of 2nd-century AD date in the Calle Franco[87] and an adjacent structure in the Calle Placentines, both on the northern side of the Cathedral, may have been the site of a statio of the collegium of the *olearii*.[88] Additional warehouse space of late 1st-century AD date was also found in the Avenida de Roma, to the south.[89] At the Plaza de la Encarnación in the northern part of the river port, by contrast, a 1st-century AD fish-sauce manufactory was decommissioned at some time between AD 70 and 120, to make way for residential housing,[90] suggesting other major changes in the configuration of the port at this time.

The commercial success of Hispalis was inextricably tied to the demands of Rome—initially for precious metals, and subsequently olive oil, the success of mine contractors and landowners in meeting them, and the activities of merchants and shippers who ensured that commodities were transported downriver to Hispalis and onwards to Rome and beyond. Silver and copper mines of 1st-century AD date have been located at a number of sites in the Sierra Morena between Aznalcóllar in the west, and Corduba in the east,[91] while the process by which the metal was transported downriver to Hispalis has been deduced from an analysis of stamps and markings on lead ingots found at wreck sites in the Mediterranean.[92]

Olive oil production, by contrast, which developed *grosso modo* between the later 1st century BC and the Late Antique period, has been detected at a myriad of villas and rural settlements across the Guadalquivir. Most of these sites were discovered during survey work in the 1960s and 1970s[93] and since few have been dated with precision it is difficult to outline broad phases in the development of rural settlement across the region. The evidence that we have, however, suggests that the main *floruit* was from the later 1st century AD onwards, with the 2nd century being a particularly intense period of settlement and exploitation. The importance of this production to Rome is illustrated by the recent discovery of an inscription of mid-2nd-century AD date beneath the Giralda in Seville. It attests the existence at Hispalis of a *diffusor olei ad annonam urbis*,[94] thus explicitly confirming the long-held suspicion that Baetican olive oil in particular was an important component of the *annona* to the city. Another index of this comes from inscriptions that mention *scapharii* and *lyntrarii*, corporations responsible for olive oil and other goods down the Guadalquivir to Hispalis,[95] with the former being based at Hispalis and closely associated with the imperial authorities, and the latter based at river ports along the Guadalquivir. Evidence for the scale of production comes from the distribution of the kilns that produced the Dressel 20 amphorae which transported the olive oil from estates to the river ports

[87] González Acuña 2010, fig. 10.
[88] González Acuña 2010, 100–101.
[89] González Acuña 2010.
[90] González Acuña 2010, 97–99.
[91] Domergue 1990.
[92] Domergue 1998.
[93] Ponsich 1974; 1979; 1987; 1991; Mattingly 1988.
[94] Chic García *et al*. 2001.
[95] Remesal Rodríguez 2012.

along the Guadalquivir to Hispalis, and which are found in large number at Rome and at other overseas markets. To date, a total of *c*. 100 kilns have been found,[96] and while only a few of these have been excavated, analysis of the *tituli picti* and stamps suggest that the volume of output was particularly high for the period between the later 1st century and the earlier 3rd century AD.[97] In particular, *c*. 75 % of all the known Dressel 20 kiln sites were active by the middle of the 2nd century AD. Rome was a primary destination of these, with Monte Testaccio acting as a witness to the large scale of import down to the mid-3rd century AD.[98] They are also found at sites across the Western Mediterranean, the north-west provinces and in the Eastern Mediterranean.

There are thus grounds to suggest that the development of port installations at Hispalis during the 2nd century AD was closely tied up with the export of olive oil to Rome. If so this might arguably represent some kind of provincial "response" to the opportunities offered by the developments at Portus under Trajan and his successors, and increased warehouse space at Rome. As with the earlier review of the evidence from Portus and Ostia, it is far harder to establish whether or not these developments were part of an overall increase in the volume of commerce between Baetica and Rome in the course of the 2nd century AD. Published ceramic deposits from Hispalis are rare, although amphorae from excavations at the Plaza de la Encarnación and Calle San Fernando point to the kind of market dominance of Dressel 20 amphorae that one would expect at their principal point of export. Published ceramic deposits also record lesser proportions of imports from Lusitania, southern Gaul, Italy and the Eastern Mediterranean.[99] One imagines that some of these containers may have arrived at Hispalis, whether directly or indirectly, on ships that returned from Portus after having transshipped their cargoes of Dressel 20 amphorae bound for Rome. Indeed, the 2nd century AD also saw the import of a range of goods from other parts of the Mediterranean, notably decorative stone that has been documented at Hispalis,[100] Italica[101] and other urban sites in the region.

Leptis Magna and hinterland

The origins of the port city of Lepcis Magna are to be sought in a small Phoenician settlement of *c*. 7th-century BC date,[102] which is located in the northern extreme of the later Roman city, situated on the Libyan coast to the

[96] Remesal Rodríguez 1998.
[97] Chic García 2001.
[98] Material from the recent excavations (Blázquez Martínez, Remesal Rodríguez & Rodríguez Almeida 1994; Blázquez Martínez & Remesal Rodríguez 1999, 2001, 2003, 2007) is beginning to provide valuable quantitative data for this—particularly for the later 2nd to mid-3rd century AD. Our understanding of earlier periods is hampered by the difficulty of accessing Trajanic and earlier levels.
[99] García Vargas 2012, fig. 12:7.
[100] Amores Carredano, Beltrán Fortes & González Acuña 2008.
[101] Mayer & Rodà 1998; Rodríguez Gutiérrez 2008.
[102] Kenrick 2009, 90.

east of Tripoli. The port was located at a critical junction on the coastal road between Carthage and Alexandria, and the road leading south-westwards towards Thenteos in the interior. This position ensured that it benefitted from the movement of traffic along the North African coast and between the Mediterranean and the interior. This privileged position, coupled with the rich agricultural resources of its immediate coastal hinterland and Gebel, notably olive oil, ensured that Lepcis Magna became one of the most prosperous cities along the North African coast.[103] As is well known, its *floruit* occurred during the reign of Septimius Severus, a native of the port, when the town was substantially enlarged and embellished with a suite of major public buildings,[104] only to fall upon hard times subsequently.

The harbour originally encompassed a relatively small area located between the eastern side of the city near the Forum Vetus and the original coastline at the mouth of the Wadi-Libdah.[105] Little of this is visible apart from traces of a Neronian portico on the western side and the temple of Jupiter Dolichenus to the east, making it difficult to get an accurate idea of its scale. However, it was greatly expanded during the Severan enlargement of the town,[106] which was complete by AD 216. The whole mouth of the Wadi Lebdah, including elements of the earlier port on its western side and three small offshore islands, were incorporated into large moles that framed a large polygonal inner basin and a roughly rectangular outer basin, some 13 ha overall, of which the latter is now underwater:[107] this is an arrangement that is in some ways similar to the Trajanic enlargement at Portus (*Figs. 11–12*). At the same time, however, recent geo-archaeological work at the harbour suggests that it was only 3.8 m deep,[108] which is sufficient for the larger sea-going cargo ships of up to *c*. 390 tons, but not the very largest vessels.[109] A lighthouse and warehouses were sited on the western mole, framing the inner and outer basins, while a "semaphore", small temple and a row of storerooms preceded by a colonnade were established on the eastern mole; the earlier temple of Jupiter Dolichenus was incorporated within the architectural scheme of the south side of the basin. Aside from the storerooms on the northern and eastern moles, however, there is as yet little evidence for the extensive warehouse space that one imagines would have been key to the success of the harbour, on account of a lack of research. An ideal position would have been on the southern side of the basin between the temple to Jupiter Dolichenus on the west and the south side of the storerooms on the eastern mole; another would have been on the higher ground on the western mole, between the end of the Severan colonnaded street and the storerooms on the northern mole. The only possible warehouses so far identified lie in the western suburbs.[110] One explanation for this might be that some goods were kept in buildings not specifically

[103] Mattingly 1995, 140–159.
[104] Ward-Perkins 1993.
[105] Kenrick 2009, 126 and fig. 55.
[106] Bartoccini 1958.
[107] Laronde 1988.
[108] Pucci *et al*. 2011.
[109] Issues discussed in respect of Portus by Boetto 2010, 118–122.
[110] Mattingly 1995, fig. 6:2.

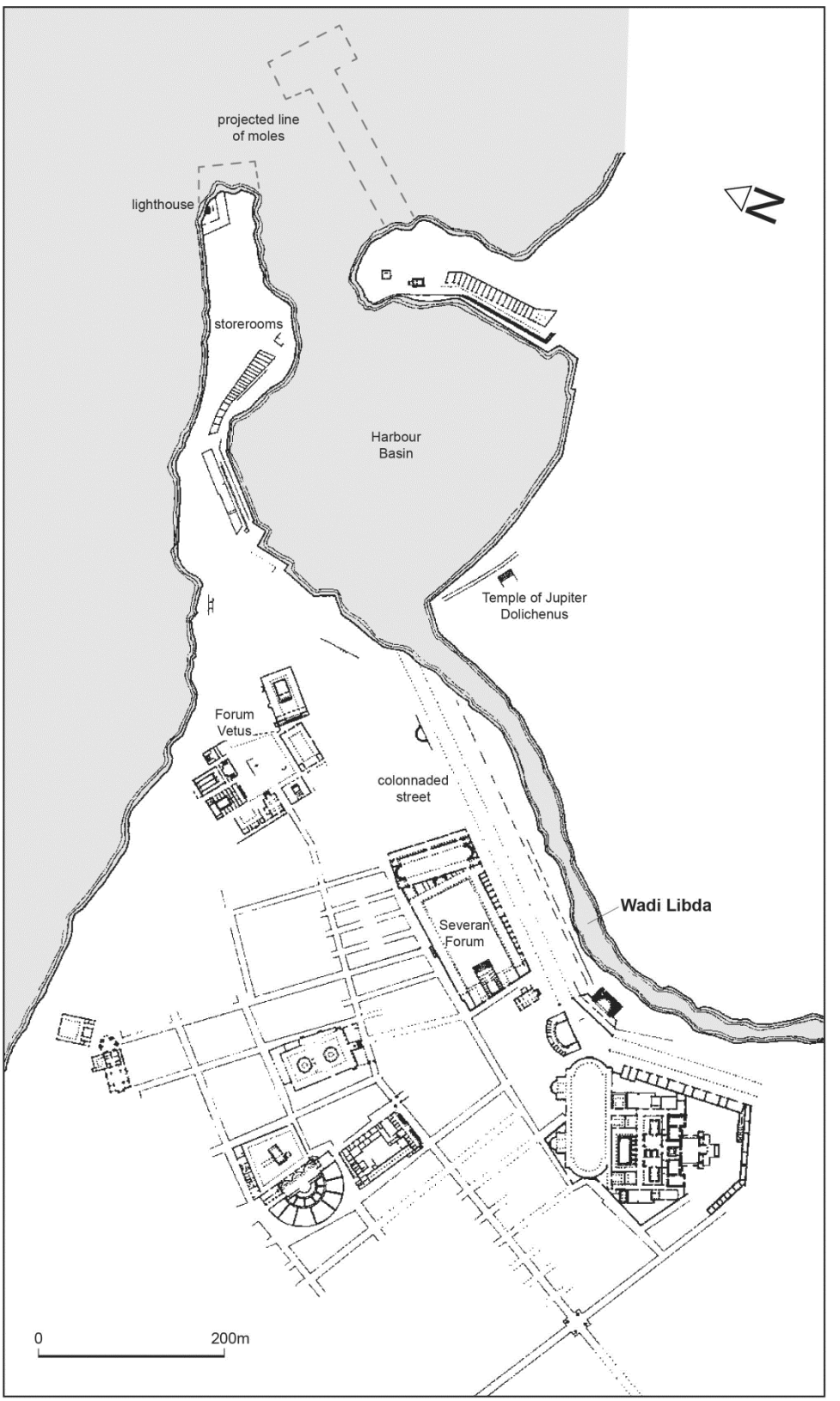

Fig. 11. Plan of the Severan port at Lepcis Magna (after MacDonald 1988, fig. 36).

Fig. 12. Photograph of the Severan port at Lepcis Magna (S. Keay).

designed for storage. As the evidence currently stands, however, the size of the basin is out of proportion to the available warehouse space, raising questions about the scale of transshipment that may have taken place at the port.

A key element in the prosperity and commercial success of Lepcis Magna was its role in the production and export of olive oil. The fine of three million pounds of olives that Caesar (*Bellum Africanum* 97.3) imposed on the city provides an index of its production potential in the mid-1st century BC, and by the later 2nd and early 3rd centuries AD it had become one of the main olive oil producers of the Western Mediterranean. Surveys in the hinterland of the town have shown that olive oil was produced widely both along the coast and in the Gebel,[111] and that the 2nd and early 3rd centuries AD represented a high point in output. Much of this was destined for overseas markets primarily in the Western Mediterranean, including Rome. The oil was sealed in Tripolitana I and III amphorae that were produced in kilns at estates owned by leading members of the Lepcitanian aristocracy in the coastal hinterlands of Lepcis Magna,[112] Oea (Tripoli) and the Gebel, and these were then exported overseas. A particularly important phase in the development of this export trade was the later 2nd and early 3rd centuries AD. Following the elevation of Septimius Severus to the imperial purple in AD 197 and his subsequent granting of *ius italicum* to Lepcis Magna,[113] there followed an especially intense period in the export of olive oil to the city of Rome. Tripolitanian amphorae accounted for a particularly large share of imports to late 2nd/early 3rd-century AD contexts at the "Palazzo

[111] Munzi *et al*. 2004 and 2004–2005; Mattingly 1988.
[112] Mattingly 1995, 153–155.
[113] Birley 1988, 218.

Figur 5

Imperiale" at Portus,[114] as well as at Ostia and at Monte Testaccio in Rome. This *floruit* was short lived, with the occupation of oil and amphora production sites falling back in the course of the 3rd century AD. A possible broader context for this might have been the inclusion by Septimius Severus of olive oil as one of the staples for free distribution in the city of Rome in the early 3rd century AD (SHA *Severus* 18.3), a development which makes it easier to understand the establishment at Rome of a *procurator ad olea comparanda per regionem Tripolitanam*.[115]

A further dimension to this picture can be added by a consideration of the traffic in marble. Recent research suggests that a significant proportion of the marble that was used in the monumentalization of Lepcis Magna under Septimius Severus came from East Mediterranean quarries. At the same time, however, while some of it was imported directly, a significant proportion of it could have been re-exported from the *statio marmorum* at Portus.[116] In this scenario, one can perhaps see ships that had transported Tripolitanian olive oil amphorae to Portus and Rome being used to bring the marble to Lepcis Magna on the return journey.

Discussion

This article is a first statement in a broader exploration of relationships between major developments at the ports of Rome and key provincial ports, their regional contexts, and commercial activity across the broader Mediterranean. Particular attention has been directed towards trying to think through "joined-up" analyses that emphasize pan-Mediterranean connections between issues that are often considered in isolation—namely the development of the commercial capacities of individual ports, the intensity of rural settlement in port hinterlands, agricultural outputs and trading patterns. This is undertaken in the belief that such approaches provide us with a better understanding of the degree of economic integration across a Mediterranean dominated by the demands of Rome. In this preliminary paper, attention is focused upon two West Mediterranean ports that had particularly close associations with Rome, namely Hispalis and Lepcis Magna. Since this has involved working with material which is unequal in terms of its coverage and methods, the paper is intended to raise questions rather than provide ready answers.

There is little doubt that the expenditure of large sums of money on infrastructure at the four ports of Rome enhanced the complementarity of their roles to the point that they acted in concert as what was in effect a "poly-focal hub" at the heart of the Mediterranean. By mediating the flows of import, export and re-distribution, the increased commercial capacity offered by the hub would have promoted the centrality of Rome to commercial life across the Mediterranean basin. In particular, the inter-port connectivity created by the network of canals, river and roads completed

[114] Zampini 2011.
[115] Munzi *et al*. 2004–2005, 447.
[116] Pensabene 2012, 81.

under Trajan reduced costs and delays in moving cargo traffic between Rome and its ports.

It can be argued that this development could have increased the accessibility of Rome to agricultural producers across the Mediterranean in general. In so far as the "poly-focal hub" was able to absorb a growing volume of traffic in the course of the 2nd century AD, one could argue that it might have helped create new opportunities for producers, merchants and shippers, and contributed towards economic integration from one region to the next. If so, this provides us with a possible context within which to understand the evidence from Hispalis and Lepcis Magna, both of which were key regional commercial hubs in the Western Mediterranean.

The degree of official involvement in the coordination of harbour works at all these ports varied. On the one hand, it seems likely that imperial investment in infrastructure in the port system around Rome under Trajan was coordinated by both imperial and urban authorities. By contrast, there is no evidence that any of the developments at Hispalis were undertaken at imperial instigation even though officials involved in the *annona* were stationed there, or at least were publicly commemorated at the port. At Lepcis Magna, however, all the relevant literary and archaeological evidence, as well as the sheer scale and the very high quality of the Severan building programme, does strongly suggest that the emperor was largely responsible for the funding or financing of the new harbour.[117] This being so, one wonders whether Severus and his advisors undertook it in the knowledge of the harbour capacity at Portus and, one imagines, the additional food supplies needed at Rome. It is surely no coincidence that there was an increase in Tripolitanian amphora exports to Portus at around this time. Furthermore, there are some strong similarities in the layout of the Severan port and the hexagonal basin at Portus, which suggest that the architects responsible for the former were very familiar with the latter.[118] All of this might be taken to suggest that Rome did at times centrally coordinate or oversee developments of port infrastructure where it suited its own interests. Another possibility is that the harbour enlargement at Lepcis, along with the embellishment of much of the rest of the port is better understood primarily as the politics of display, with commercial considerations being secondary.

Intuitively it makes good sense that the establishment of new deep-water basins at Portus and Centumcellae under Trajan, and a gradual increase in warehousing capacity at the latter in the course of the 2nd century, would have boosted the volume of commercial traffic moving between these and other ports. Indeed, one could easily envisage a situation in which a growing proportion of larger ships than before plied the waters between Lepcis Magna, Hispalis and Portus and Centumcellae in the course of the 2nd and early 3rd centuries AD, carrying ever-greater quantities of olive oil and other commodities to the Roman market. Attractive as this may seem, however, current evidence simply does not support such conclusions, which remain speculative. Developing more sophisticated ways of querying the underwater

[117] Birley 1988, 218; Mattingly 1995, 120–122.
[118] Tuck 2008, 335–341.

record and quantifying the evidence provided by ceramics and marble is clearly a challenge for the future.

The development of port infrastructure at Hispalis during the early 2nd century AD probably enhanced the ability of olive oil producers along the Guadalquivir valley, merchants and shippers to better meet their growing obligations to contribute to the *annona* to Rome; evidence from the port and sites in the Guadalquivir valley in general confirms that exports to the city grew in the course of the later 1st century AD and the first half of the 2nd.[119] It is less clear, however, whether merchants based at the port were also able to take more advantage of other commercial opportunities across the Western Mediterranean in general, so promoting a greater degree of economic integration than had been possible before. Discovering whether there was an increase in the geographical range of secondary suppliers of amphora-borne foodstuffs over the same period is, therefore, clearly a priority for future study. The enlargement of the harbour at Lepcis Magna under Septimius Severus was broadly contemporary with major changes in port infrastructure and storage provision at Portus. Although there is no hard evidence to suggest that the two developments were the result of coordinated planning, it is possible that together they could have greatly enhanced commercial opportunities for the producers, merchants and shippers based at both ports. The large quantities of Tripolitana III olive oil amphorae in later 2nd-/early 3rd-century AD contexts at both Portus and Monte Testaccio would tend to support this, as would the presence of some varieties of marble imported to Lepcis.

The high degree of economic and commercial integration implied by this kind of argument, however, does need to be tempered by considering the realities and challenges of moving foodstuffs and non-perishable goods from places of production in the hinterlands of provincial ports to their penultimate destination at Portus and Centumcellae. A proper consideration of these challenges lies beyond the scope of this paper. However, it is clear that significant delays were likely at every stage of the route taken by specific goods: (i) from production area to warehouse at port of origin, (ii) from there to embarkation on the ship, (iii) in sailing out of the harbour, (iv) the choice of route taken by the ship, (v) upon entering and being unloaded at Portus, (vi) and on moving through the port system before final arrival at warehouses in the emporium of the Portus Tiberinus. While the delays are difficult to quantify they do better help us understand why the flow of information between Rome and the Mediterranean provinces could sometimes be extremely slow.[120] Thus, while there is an understandable temptation to think of a closely integrated Mediterranean basin with goods and people moving fairly quickly from one region to another, delays of this kind raise important questions about the depth of economic integration.

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[119] García Vargas 2012; Chic García 2001.
[120] Keay 2012b, 2–21.

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