

Amphorae, Roman

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Summary

Amphorae were large ceramic jars employed in the Roman world for the packaging and transport of a limited set of liquid and semi-liquid foodstuffs - chiefly wine, olive oil, and various kinds of fish preserves and processed fish products - and certain other substances.¹ They were manufactured in a large number of distinct shapes - generally referred to as classes - linked to specific regions and employed for specific kinds of content. For this reason amphorae are treated by scholars as proxy markers for the distribution of these categories of foodstuffs and, on account of their abundance and ubiquity in the archaeological record, they constitute one of the most important forms of material evidence for economic activity in the Roman world from the third century BCE down to the end of antiquity.

Evidence for amphorae

We possess a wide range of evidence relating to amphorae. The remains of workshops in which amphorae were manufactured have been identified in many parts of the Roman world, and many of these have been subject to surface investigations and/or excavation. Amphorae occur in abundance on archaeological sites in most parts of the Roman world, most often in fragmentary condition, though in some cases more or less intact. These include amphora production workshops, sites relating to their filling or distribution (food processing/packaging facilities, harbors, warehouses, retail outlets, the wrecks of merchant ships that were carrying filled amphorae as cargo), and consumption sites, where they are commonly recovered in discard contexts and, less often, in contexts relating to their use. The fabric of amphorae can be analysed to determine the techniques employed in their manufacture and their likely place of origin. In some cases amphorae preserve remains of their content - either macro-remains (e.g., fish scales, fruit stones) or absorbed residues - and these can be analysed to identify the substance in question. Many classes of amphorae regularly bear a more or less elaborate and diverse set of texts, including stamps executed prior to firing, graffiti incised in some cases prior to and in others subsequent to firing, stamps impressed into the upper surface of the container's stopper at the time of its filling, and *tituli picti* (painted labels) executed at or subsequent to filling.² These can shed light on the point of origin of the container and/or its content; the organization of and/or the individuals responsible for the container's manufacture, filling, and/or distribution; the nature and/or amount of its content; and/or the date of its manufacture or filling. In a limited number of instances literary texts in Latin, Greek, and Aramaic/Hebrew of the Roman period provide information regarding the use of amphorae, as does a growing corpus of published documentary texts, including papyri, *ostraca*, and *tabellae ceratae*.³ We also possess a modest number of representations of amphorae and the practices involved in their use in various media, including frescoes, mosaics, terracotta statuettes, and stone sculptures in relief and in the round.⁴

Amphora classes

Scholars have produced several more or less geographically and chronologically comprehensive classificatory schemes for Roman amphorae. The various classes recognized in these are usually given a designation based on the name of the author (e.g., Dressel 20), the region in which the containers being taken into consideration originated (e.g., Tripolitanian 1), or the site at which they were recovered (e.g., Richborough 527). There is no single definitive classificatory system, and many classes are referred to in the literature by two or more different names. In most cases a class's general region or specific point(s) of origin and the chronology of its manufacture have been reasonably well established. We also possess some notion of the likely content for most classes, although in many cases this is conjectural and remains susceptible to revision.

The different amphorae classes varied considerably in shape, size, and capacity, with the figures for height, for example, ranging from 45 to 120 centimeters, and those for capacity from 3 to 185 liters. (Figure 1) Most classes had a neck, although some lacked this element. Nearly all classes had two opposed handles on the neck, neck and shoulder, or upper body, although a few had but a single handle or lacked handles altogether. Most classes had a wider or narrower cylindrical or convex body terminating in a more or less elongated spike or a rounded bottom. Some classes in the smaller size range (less than c. 20 liters) had a flat bottom, usually provided with a ring foot.



Figure 1: Roman amphorae of various different classes from the Castro Praetorio site, Rome. Museo dei Fori Imperiali, Rome. (permission required from Alamy.)

Most classes were manufactured in multiple workshops spread over some smaller or larger area, and for this reason examples of the same class may exhibit some degree of morphological variability and are often attested in two or more distinct fabrics. For the most part amphora fabrics are of a medium, coarse, or porphyritic texture, although fine-textured fabrics are also attested for some classes. In most cases a class was manufactured for a period of at least c. one century to as long as several centuries, with some morphological development attested over time.

Amphorae were manufactured in a determined shape and size with a view to realizing a container of a standard capacity that could be employed for the packaging of a specific amount of content.⁵ In some cases it is evident that there were two or more different capacity modules within a single class. One attribute of an amphora class that scholars recognize is its efficiency, defined as the ratio of liters capacity to kilograms of container weight.⁶ The standardization of the size and capacity of amphorae would have facilitated the manufacture and acquisition of containers and the packaging of content, the handling, transport, and storage of filled amphorae, and the determination of the amount of content represented by one or more filled containers for purposes of sale and/or taxation.

Different kinds of amphorae are regularly referred to in literary and documentary texts by specific names that in most cases refer to the container's place of origin.⁷ This indicates that many persons were able to recognize different kinds of amphorae and had some knowledge of their place of origin and presumably also their content. Interesting in this regard is the fact that it was a fairly widespread (if probably for the most part low-intensity) practice for workshops located outside a class's principal region of origin to manufacture copies of that class.

Amphora content

Various forms of evidence indicate the content or contents normally packaged in a specific class. These include the locale or region in which a class originated, as this might be associated with a particular content; the class's size and morphology, which in some cases were associated with and/or were more or less suitable for the packaging of a specific content; indications of container content provided by *tituli picti*; and content remains.⁸

In most cases it appears that a class was normally utilized for the packaging of one content or two or more related contents. Many classes in the middle to lower end of the capacity range (c. 30 liters and less) were employed for the packaging of wine and related products (vinegar wine, must). Many classes in the middle to upper capacity range (c. 30 liters and greater) were employed for the packaging of olive oil and/or olives. Other classes in the middle of the capacity range (c. 20-40 liters) were employed for the packaging of fish preserves or fish products. In rare cases a class was employed for the packaging of some other kind of foodstuff, such as dates or honey, or for the packaging of a mineral substance, such as alum. Examples of classes normally employed for the packaging of the substances just indicated sometimes were employed for the packaging of some other substance, such as fruit, nuts, pine pitch, or volcanic sand.

Manufacture and filling of amphorae

The organization of the manufacture of amphorae and the location of the workshops where this took place differed from region to region and through time. In some cases amphorae were manufactured by workshops that appear to have specialized exclusively in the production of these containers, while in others the establishment turned out a wider range of ceramics. Some classes regularly bear stamps on the rim, handle, neck, or spike that record the name of the workshop owner or manager. In some cases workshops were located on or near the agricultural estate where the wine or olive oil that the amphorae were destined to contain originated or at or near the *cetariae* (fish processing facility) at which the fish preserves or fish products that they were destined to contain originated. In other cases it seems likely that wine and olive oil produced in inland areas was transported a considerable distance to a river port or coastal port - most likely in *utres* and/or *cullei* (small and large skin containers, respectively) - before being transferred to amphorae manufactured at or near the port for further distribution by river craft or ship.⁹

Examples of several classes of amphorae were treated prior to filling by having their interior coated with a layer of pine pitch in order to reduce the container's permeability. The incidence of this practice is impossible to estimate due to the irregular preservation of these coatings, although it seems likely that this was regularly carried out with many classes destined for the packaging of wine and fish products. Although it was long maintained that the presence of a pitch coating precluded a content of olive oil on the assumption that oil would dissolve such a lining, recent research has identified instances in which an amphora with a pitch lining was used for the packaging of oil.¹⁰

There is slight and conflicting evidence regarding the level to which amphorae were filled, and it is likely that this differed from class to class, locale to locale, or by content. After filling amphorae were stoppered.¹¹ This involved plugging the mouth with a purpose-made pottery lid, a cork disk, a sherd shaped into a disk, or one or more irregular sherds, and then pouring a layer of liquid plaster (sometimes mixed with pozzolana) over the top of the plug and allowing this to harden, or covering the plug with a layer of clay, mud, or asphalt to form a seal. In some cases the stopper was provided with textile or cord pulls to facilitate its extraction, and sometimes its upper surface was painted, perhaps to indicate the nature of the content. The owner of the amphora's content would sometimes indicate ownership by using a seal to impress his or her name (usually abbreviated as the initials of their *nomina*) and/or sign into the upper surface of the plaster before it had hardened. Some classes were regularly provided with a *titulus pictus* in black, red, or white paint on the neck or wall at the time of filling. These vary considerably with regard to their format and content from class to class, though they may indicate - often in abbreviated form - the nature, origin, or amount of the content, the year, the identity of the container's owner, the shipper responsible for its carriage, or the person to whom it was to be delivered.

Transport of amphorae

Most filled amphorae were light enough and of a suitably manageable shape that they could have been carried over short distances by a single porter, either balanced on the shoulder or slung on

the back.¹² (Figure 2) Some of the larger classes, however, were suspended from a carrying pole and moved by a pair of porters. Some classes with a cylindrical body and compact handles on the neck may have been maneuvered over short distances at transshipment and storage facilities by being rolled.



Figure 2: Marble relief depicting porter carrying amphora on his back. Metropolitan Museum of Art 25.78.63. Third century CE, provenance unknown (permission not required).

Filled amphorae were transported over longer distances by ship, river craft, pack animal, or wheeled vehicle. Merchantmen were rated for their cargo capacity by the number of amphorae that they could carry, and these vessels regularly took on from several hundred to as many as c. 13000 of these containers. Examples of most classes were probably loaded and unloaded from ships and river craft by being carried up/down a gangway by porter, although for some larger, heavier classes this may have been accomplished by means of a crane. Amphorae were stowed in the cargo space in the hull of a ship by being packed together in a vertical position, with dunnage consisting of branches or some other soft material inserted between adjacent containers so that they would not chafe against one another during the voyage. The fact that a container terminated in a spike facilitated its positioning against the curved planking of the hull. In some ships the cargo space was deep enough that it was possible to stow amphorae in as many as five layers, with the spike of containers in the upper layer inserted into the space left between the necks of

four adjacent containers in the lower layer. For overland transport most small- to medium-sized amphorae were probably loaded on a pack animal (mule, donkey, or camel) in groups of two or four, with one-half of this number slung to either side of the animal's back. (Figure 3) Large amphorae would have been too heavy to transport in this way and must have been moved by cart or wagon.



Figure 3: Terracotta figurine of camel carrying four amphorae on its back. Metropolitan Museum of Art 89.2.2093. Late second to early third century CE, provenance unknown (permission not required).

Emptying of amphorae and disposal of used amphorae

Upon arrival at their destination filled amphorae may have been emptied of their content right away or been held unopened for a shorter or longer period of time, being employed, in effect, as storage jars. They were presumably for the most part stored in a vertical position, with those having a spike simply leaned against a wall or against other amphorae. Amphorae were opened for the removal of some or all of their content by the extraction of the stopper, the cutting or breaking away of the entire rim and upper neck, or the drilling of a hole or cutting of an aperture in the shoulder or body.¹³

Most amphorae were presumably discarded after being emptied of their content. There is evidence, however, that in some instances amphorae were reused as packaging/transport containers, presumably after cleaning and reconditioning.¹⁴ Containers that had been emptied of their content were also in many instances repurposed for a wide variety of applications, either as they were or after being subjected to a modification of some kind (e.g., the removal of the neck and handles) or being broken or cut into parts.¹⁵

Amphora research

Amphora research represents a field of specialization within Roman pottery studies, with several more or less distinct areas of investigation. These include the following:

Prospection for and investigation of production sites: This research is aimed at improving our understanding of the provenance of specific classes and fabrics, the elucidation of the manufacturing process, and the organization and geography of amphora production.

Study of assemblages from shipwreck sites: This research is aimed at improving our understanding of practices of the composition of cargoes, the geography of shipping routes, and the organization and chronological development of maritime trade. It also contributes to our understanding of the morphology and chronology of classes, as studies of this kind often consider large numbers of intact containers recovered in a closely dated, use-related context.

Study of assemblages from consumption sites: This research is aimed at the investigation of patterns in the distribution and consumption of the foodstuffs packaged in amphorae. It generally involves the classification and quantification of assemblages from one or more sites. Studies of this kind are complicated by questions regarding the methods best suited for the quantification of amphora assemblages and the analysis of the resulting datasets, the presence of residual materials, possible effects introduced by the packaging of content in amphorae manufactured at a distance from its point of origin, the reuse of amphorae as packaging containers, and the reuse of amphorae for other purposes.¹⁶ Also a problem is the effective absence from the archaeological record of wooden barrels, which were regularly employed for the packaging of wine in many parts of the Roman world during the middle and late imperial periods.¹⁷

Epigraphical studies: This research involves the collection and interpretation of these often enigmatic texts with a view to shedding light on the organization of the production of amphoras, amphora content, and the filling and distribution of filled amphoras.

Fabric analysis: This research for the most part involves the characterization of the mineralogical composition and texture of fabrics by means of petrographic (thin section) analysis with a view to identifying the raw materials and raw material processing practices employed in manufacture, the determination of the characteristics of fabrics of known origin (e.g., those associated with a specific manufacturing site), and the definition, characterization, and determination of the likely provenance of fabrics of unknown origin.¹⁸

Container capacity analysis: This research is aimed at determining the modules represented by specific classes and shedding light on packaging practices. The determination of container capacity traditionally involved direct measurement by filling intact containers with water or some granular solid (e.g., glass beads, rice). In more recent studies CAD-based routines have been employed to calculate container capacity from profile drawings.¹⁹

Content analysis: This involves the study of macro remains using traditional archaeobotanical and zooarchaeological methods and/or the use of archaeometric techniques (gas chromatography, mass spectrometry, and DNA analysis) to identify absorbed residues with a view to determining the content(s) of specific containers and elucidate packaging practices.

Keywords

Roman economy, Roman agriculture, Roman ceramics, Roman trade, Roman transport, Roman food supply, packaging, containerization.

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Links to digital materials

Websites

[Amphorae ex Hispania](#)

[Atlas du Patrimoine Archéologique Littoral Méditerranéen \(Glossaire. s.v. amphore\)](#)

[Corpus Informático del Instrumentum Domesticum](#)

[Oxford Roman Economy Project Shipwrecks Database](#)

[Potsherd: Atlas of Roman Pottery \(amphora section\)](#)

[Roman amphorae: a digital resource](#)

[Recueil de timbres sur les amphores romaines](#)

Videos

[Dressel e le anfore](#)

[The Amphora Graveyard of Monte Testaccio, Rome](#)

3D Models

[Roman Amphora Pack Low-poly 3D model](#)

Notes

¹ For a general consideration of packaging/containerisation in the pre-modern Mediterranean see Andrew Bevan, "Mediterranean containerization," *Current Anthropology* 55 (2014): 387-418.

² For overviews of texts on Roman amphorae see Daniele Manacorda and Clementina Panella, "Anfore," in *The Inscribed Economy: Production and Distribution in the Roman Empire in the Light of Instrumentum Domesticum*, ed. William Harris. *Journal of Roman Archaeology Supplementary Series* 6, 55-64 (Ann Arbor: Journal of Roman Archaeology, 1993); Alison Cooley, *The Cambridge Manual of Latin Epigraphy* (Cambridge: Cambridge University Press, 2012), 89-94, 193-196; Jonathan Edmondson "Economic life in the Roman Empire," in *The Oxford Handbook of Roman Epigraphy*, eds. Christer Bruun and Jonathan Edmondson (Oxford: Oxford University Press, 2014), 683-687.

³ For the papyrological evidence regarding amphora production see Scott Gallimore, "Amphora production in the Roman world. A view from the papyri," *Bulletin of the American Society of Papyrologists* 47 (2010): 155-184.

⁴ For representations of amphorae in various media see John Lund, "Iconographic evidence for the handling and use of transport amphorae in the Roman period," in *Pottery in the Archaeological Record: Greece and Beyond*. Gösta Enbom Monographs 1, eds. Mark Lawall and John Lund, 52-60 (Aarhus: Aarhus University Press, 2011).

⁵ Wine was generally packaged by volume, olive oil and fish products by weight. The standard module for the measuring of liquids in the Roman world, equal to 1 cubic Roman foot, or 26.2 liters, was termed the *amphora quadrantal*, and often referred to simply as a *quadrantal* or an *amphora*.

⁶ For amphora efficiency see David Peacock and David Williams, *Amphorae and the Roman Economy* (London: Routledge, 1986), 51-53.

⁷ For amphora names see Nico Kruit and Klaas Warp, "Geographical jar names: towards a multi-disciplinary approach," *Archiv für Papyrusforschung* 46 (2000): 65-146.

⁸ For the evidence for amphora content see Darío Bernal, "What contents do we characterize in Roman amphorae?" in *ArchaeoAnalytics: Chromatography and DNA Analysis in Archaeology*, eds. César Oliveira, Rui Morais, and Ángel Morillo Cerdán, 61-83 (Esposende: Município de Esposende, 2015) and the several studies in Darío Bernal, Michel Bonifay, and Alessandra Pecci, eds. *Roman Amphora Contents: Reflecting on Maritime Trade of Foodstuffs in Antiquity*. Roman and Late Antique Mediterranean Pottery 9 (Oxford: Archaeopress, 2019).

⁹ For skin containers see Élise Marlière, *L'outre et le tonneau dans l'Occident romaine*. Monographies *Instrumentum* 22 (Montagnac: Mergoïl, 2002), 13-26, 187-196.

¹⁰ For this issue see Alessandra Pecci and Miguel Cau, "Análisis de residuos orgánicos en ánforas. El problema de la resina y del aceite," in *Estudios sobre el Monte Testaccio (Roma) V*. Collección Instrumenta 35, eds. José María Blazquez and José Remesal, 593-600 (Barcelona: Universitat de Barcelona, 2010).

¹¹ For the stoppering of amphorae see Ross Thomas, "Roman vessel stoppers," in *Myos Hormos - Quseir al-Qadim. Roman and Islamic Ports on the Red Sea. Volume 2: Finds from the Excavations 1999-2003*. British Archaeological Reports International Series 2286/University of Southampton Series in Archaeology 6, eds. David Peacock and Lucy Blue, 11-34 (Oxford, Archaeopress, 2011).

¹² For the ergonomics of the handling of amphorae see Michael McCormick, "Movements and markets in the First Millennium: information, containers, and shipwrecks," in *Trade and Markets in Byzantium*, ed. Cécile Morrison (Washington D.C.: Dumbarton Oaks, 2012) 61-64.

¹³ For the holing of amphorae in connection with their emptying see Matthew Loughton and Laurence Alberghi, "Body piercing during the late iron age: the case of Roman amphorae from Toulouse (France)," *HEROM: Journal on Hellenistic and Roman Material Culture* 4 (2015): 53-106.

¹⁴ For this practice see J. Theodore Peña, *Roman Pottery in the Archaeological Record* (Cambridge, Cambridge University, 2007), 61-118.

¹⁵ For these practices see J. Theodore Peña, *Roman Pottery in the Archaeological Record* (Cambridge, Cambridge University, 2007), 119-192; Itamar Taxel, *Fragile Biography: The Life Cycle of Ceramics and Refuse Disposal Patterns in Late Antique and Early Medieval Palestine* (Leuven – Paris – Bristol, CT: Peeters, 2018), 71-115.

¹⁶ For these issues see Andrew Wilson, "Approaches to quantifying Roman trade," in *Quantifying the Roman Economy: Methods and Problems*. Oxford Studies in the Roman Economy 1, eds. Andrew Wilson and Alan Bowman (Oxford: Oxford University Press, 2009), 229-237; Paul Johnson, *Economic Evidence and the Changing Nature of Urban Space in Late Antique Rome*. Col·lecció Instrumenta 42 (Barcelona: Universitat de Barcelona, 2012), 69-90.

¹⁷ For barrels see É·lise Marlière, *L'outre et le tonneau dans l'Occident romaine*. Monographies Instrumentum 22 (Montagnac: Mergoïl, 2002), 27-196.

¹⁸ For an example of research of this kind see Claudio Capelli and Michel Bonifay, "Archeologia e archeometria delle anfore dell'Africa romana. Nuovi dati e problemi aperti," in *Le regole del gioco tracce archeologi raccontati: studi in onore di Clementina Panella*. Lexicon Topographicum Urbis Romae Supplementum VI, eds. Antonio Ferrandes and Giacomo Pardini, 535-557 (Rome: Quasar, 2016).

¹⁹ For examples of this method see Victor Martínez, "Do we have the capacity to understand Lusitanian commodities? Volumetric calculations of Lusitanian amphora types," in *Lusitanian Amphorae: Production and Distribution*. Roman and Late Antique Mediterranean Pottery 10, eds. Inês Vaz Pinto, Rui Roberto De Almeida, and Archer Martin, 129-136 (Oxford: Archaeopress, 2016); Jaime Molina Vidal and Daniel Mateo Corredor, "The Roman amphorae average capacity (AC)," *Oxford Journal of Archaeology* 37 (2018): 299-311.