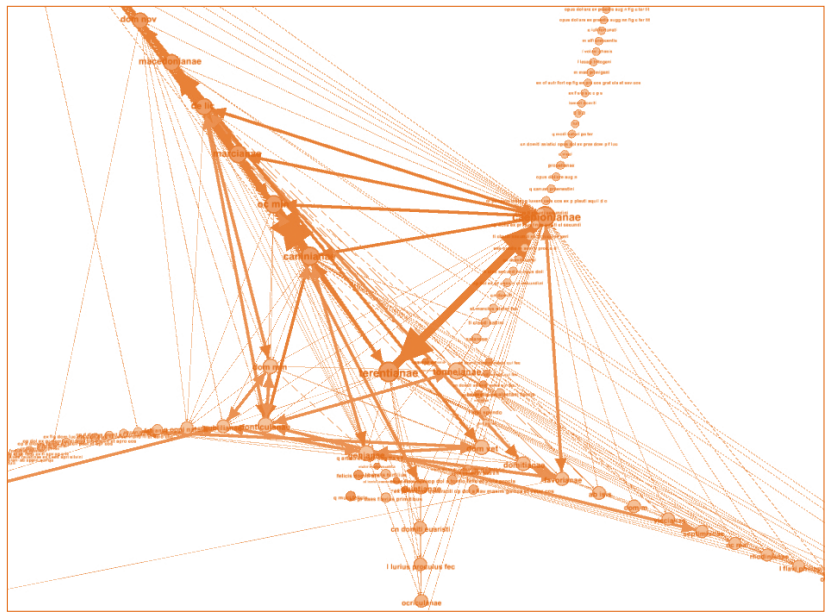
N° 135

Mars
2014

# Les Nouvelles de l'archéologie



## Analyse des réseaux sociaux en archéologie

Éditions de la Maison des sciences de l'homme
Éditions Errance

# Les Nouvelles de l'archéologie

## Sommaire




N° 135
Mars 2014


En couverture :
Detail of network of *figlinae* connected by use of common *signa*, filtered to show only ties of weight 2 or above (S. Graham).

Rédaction
Fondation de la maison des sciences de l'homme
190, avenue de France
CS nº 71345
75648 Paris cedex 13
Téléphone : 01 53 48 56 37
Courriel : nda@msh-paris.fr
Internet : http://www.nda.msh-paris.fr

Directeur scientifique
François Giligny (*Université de Paris-I*)

Rédactrice en chef
Armelle Bonis (*Conseil général du Val-d'Oise, direction de l'Action culturelle*)

Secrétaire de rédaction
Nathalie Vaillant (*FMSH*)

Relecture et maquette
Virginie Teillet (*Italiques*)



Directeur de publication
Michel Wieviorka (*FMSH*)

Abonnement
ÉPONA SARL, 82 rue Bonaparte, 75006 Paris.
Tél. : 01 43 26 40 41. Fax : 01 43 29 34 88.
Courriel : archeoli@club-internet.fr

Vente
http://www.lcdpu.fr/revues/?collection_id=1666
Comptoir des presses, 86 rue Claude Bernard,
75005 Paris. Tél. : 01 47 07 83 27

# *Les Nouvelles de l'archéologie*

Revue de la Fondation de la maison des sciences de l'homme, soutenue par la sous-direction de l'archéologie (ministère de la Culture) et l'Institut national des sciences humaines et sociales du CNRS. Les articles publiés, approuvés par le comité de lecture, sont sollicités par le comité de rédaction ou envoyés spontanément par leurs auteurs.

*Les Nouvelles de l'archéologie* proposent régulièrement un dossier de trente à cinquante pages ou des actes de colloques, séminaires, tables rondes, dont les thématiques concordent avec la ligne éditoriale. La revue publie aussi des articles d'actualité et des informations sur la politique de la recherche, l'enseignement et la formation, le financement et les métiers de l'archéologie, les expositions, publications, congrès, films, sites Internet et autres moyens de diffusion des connaissances. Ces dernières sont également mises en ligne, ce qui permet de suivre l'actualité entre deux livraisons.

## RECOMMANDATIONS AUX AUTEURS

L'article ne peut excéder 25 000 signes, notes et bibliographie comprises. Le nombre maximum d'illustrations est fixé à cinq. Les appels bibliographiques doivent figurer dans le texte entre parenthèses, selon le système (auteur date). Les références complètes doivent être regroupées en fin d'article, par ordre alphabétique et, pour un même auteur, par ordre chronologique. Dans le cas de plusieurs articles publiés la même année par un même auteur, mettre par exemple 2001a, 2001b, 2001c. Les rapports finaux d'opération (RFO) et les mémoires universitaires sont déconseillés en bibliographie – sauf s'ils n'ont pas encore fait l'objet d'une publication.
Les articles sont soumis à une évaluation anonyme par le comité de lecture et relus par le responsable éventuel du dossier. Les auteurs sont tenus d'intégrer les modifications demandées, qu'elles soient d'ordre scientifique ou rédactionnel. Dans le cas d'un article à signatures multiples, la rédaction n'entre en relation qu'avec le premier auteur, à charge pour lui de négocier les corrections avec ses coauteurs.
La publication de chaque article est conditionnée par la signature et le renvoi du contrat d'auteur.
Le bon à tirer final de chaque numéro est donné par la rédaction des *Nouvelles de l'archéologie*, qui se réserve le droit d'apporter d'ultimes corrections formelles. Après publication, l'auteur reçoit un exemplaire du numéro et une version pdf de son article.

### Présentation des références dans le texte et en bibliographie

• (Auteur date, volume : pages). Exemple : (Dumont 1983 : 113-130) ou bien (Lepage 1756, 2 : 223-598). En l'absence d'auteur, remplacer le nom d'auteur par le titre abrégé. Exemple : (*Dictionnaire des synonymes*... 1992 : 33-46).
• Pour les ouvrages : Nom, initiale du prénom. Date. *Titre.* Lieu d'édition, éditeur, nombre de pages. Ex. : LOTHAIRE, E. 1989. *Figures de danse bulgares*. Paris, Dunod.
• Pour un article dans une revue : Nom, initiale du prénom. Date. « Titre de l'article », *titre de la revue*, volume, numéro : page à page. Ex. : GLASSNER, J. 1993. « Formes d'appropriation du sol en Mésopotamie », *Journal asiatique*, 16, 273 : 11-59.
• Pour un article dans un volume d'actes par exemple : Nom, initiale du prénom. Date. « Titre de l'article », *in* : prénom et nom des directeurs de l'ouvrage, *titre de l'ouvrage*. Ville d'édition, éditeur : page à page. Ex. : LEMONNIER, P. 1997. « Mipela wan bilas. Identité et variabilité socio-culturelle chez les Anga de Nouvelle-Guinée », *in* : S. TCHERKÉZOFF & F. MARSAUDON (éd.), *Le Pacifique-Sud aujourd'hui : identités et transformations culturelles*. Paris, CNRS Éditions : 196-227.

DOSSIERS À PARAÎTRE : Archéologie pour la ville. Archéologie moderne et contemporaine. L'archéométrie en France. Archéologie des hautes latitudes.

Le n° 135 a été tiré à 800 exemplaires.

Abonnement du 1er janvier au 31 décembre 2014 – 4 numéros :
FRANCE : 40 euros (étudiants : 36 euros)
ÉTRANGER : 44 euros (étudiants : 40 euros)
PRIX AU NUMÉRO : 12 euros

ISSN : 0242-7702. ISBN : 978-2-7351-1701-7.

# Éditorial

*Les Nouvelles de l'archéologie* ont choisi de laisser la place dans ce numéro à un thème dont l'apparition est relativement récente dans le panorama des méthodologies appliquées, celui de l'analyse des réseaux sociaux, ou *Social Network Analysis* en anglais, et ont confié sa coordination au Professeur Carl Knappett de l'université de Toronto, qui s'est beaucoup investi et a rédigé ou coordonné plusieurs ouvrages sur ce sujet.

C'est à la fois la nature de ce thème, mais aussi son expansion rapide dans le monde académique international qui expliquent qu'une partie des articles proposés ont été directement rédigés et publiés en anglais. L'autre raison justifiant ce choix est le déroulement en France pour la première fois de son histoire de la 42e conférence internationale du *Computer Applications and Quantitative Methods in Archaeology* (CAA2014) qui s'est déroulée à Paris du 22 au 25 avril dernier, et dont *Les Nouvelles de l'archéologie* étaient partenaires, ainsi que de la Conférence *The Connected Past* qui s'est également tenue à Paris immédiatement après le CAA, le 26 avril[1].

Ces deux événements ont permis de donner une image assez complète des applications de ce nouveau champ méthodologique dans la discipline archéologique. Si ce domaine est déjà bien exploré et investi par les chercheurs en sociologie en France, l'archéologie est restée jusqu'à présent un peu en retrait. Nous espérons que l'impact de ces événements et du présent numéro susciteront l'intérêt des archéologues et généreront de plus nombreuses études de cas et collaborations dans ce champ prometteur.

1. http://caa2014.sciencesconf.org ; http://connectedpast.soton.ac.uk/conference-2014

Burt R. 1992. *Structural Holes*. Cambridge, Mass., Harvard University Press.

Burt R. 2005. *Brokerage and Closure: An Introduction to Social Capital*. New York and Oxford, Oxford University Press.

Cornell T.J. 1995. *The Beginnings of Rome. Italy and Rome from the Bronze Age to the Punic Wars (c. 1000-264 BC)*. London and NY, Routledge.

Davis J.A. & Leinhardt S. 1972. The structure of positive interpersonal relations in small groups, *in* J. Berger (ed.), *Sociological Theories in Progress*. Volume 2. Boston, Houghton Mifflin : 218-251.

Faust K. 2006. Comparing Social Networks: Size, Density and Local Structure. *Metodološki zvezki*, 3 (2) : 185-216.

Goodreau S., Kitts J. & Morris M. 2009. "Birds of a Feather or Friend of a Friend? Using Exponential Random Graph Models to Investigate Adolescent Friendship Networks", *Demography*, 46 (1): 103-126.

Granovetter M. 1973. "The Strength of Weak Ties", *American Journal of Sociology*, 78: 1360-1380.

Kitts J. A. & Huang J. 2010. "Triads", *in* Barnett A. G. (ed.), *Encyclopedia of Social Networks*. New York, Sage Publications.

Holland P. & Leinhardt S. 1970. "A method for detecting structure in sociometric data", *American Journal of Sociology*, 76.3: 492-513.

Mizoguchi K. 2009. "Nodes and edges: A network approach to hierarchisation and state formation in Japan", *Journal of Anthropological Archaeology*, 28 : 14-26.

Negroni Catacchio N. 1981. *Sorgenti della Nova. Una comunità protostorica e il suo territorio nell'Etruria meridionale*. Consiglio Nazionale delle Ricerche, Rome.

Pallottino M. 1981. *Genti e culture dell'Italia preromana*. Rome, Jouvence.

Ruffini G. 2008. *Social Networks in Byzantine Egypt*. Cambridge University Press, Cambridge.

# Maritime Networks and Economic Regionalism in the Roman Eastern Mediterranean

*Justin Leidwanger**

*Résumé*

Les échanges en Méditerranée romaine ont souvent été décrits avec une terminologie générique de réseau, mais les théories ou les méthodes d'analyse de réseaux ont rarement été appliquées aux données archéologiques concernant les liaisons maritimes romaines. Par l'étude de cas autour de l'île de Chypre, cet article présente comment les approches de réseau pourraient informer l'analyse de la connectivité maritime, économique et sociale à différentes échelles dans le monde antique. L'emplacement des ports, la taille des cargaisons et la durée approximative des voyages sont autant de paramètres fournis par des des épaves naufragées qui permettent de caractériser l'activité des réseaux. Dans ce cas, ils reliaient des communautés au-delà des principaux ports urbains côtiers dans une économie maritime fortement régionalisée. Cette approche définit et souligne une échelle régionale par opposition aux activités locales ou de longue distance. Elle soulève des questions critiques sur la structure et le fonctionnement des réseaux à la lumière des conditions socio-économiques et de la logistique marine antique et elle fournit un cadre pour l'étude du développement de marchés au sein de l'économie maritime romaine. Plutôt que révéler un simple « réseau commercial » expansif et bien intégré à travers la Méditerranée romaine, elle suggère la coexistence de réseaux régionaux et interrégionaux discrets, multiples, centrés sur des produits distincts, des navires, des distances, des agents, des communautés et des mécanismes économiques.

Despite a scholarly fondness for general network metaphors,[1] few of the broad theoretical constructs or specific methodological tools of network analysis have been employed in studying the archaeological evidence for Roman maritime connectivity. Yet there is a growing awareness of the role played by webs of personal and community relationships in structuring exchange systems across the breadth of the ancient world, with the result that social network analysis may increasingly help to guide our approaches to the historical and material evidence (Brughmans 2013;

1. E.g. network metaphors among the various contributions to "A Forum on Trade" in Scheidel 2012.

* *Stanford University, jleidwa@stanford.edu*

Knappett 2013). Taco Terpstra's (2013) recent treatment of ethnic communities of foreign traders, for example, suggests that the social bonds within these communities served to underpin long-distance trade in the Roman Mediterranean.

Most historically based studies of Roman exchange networks have been developed on a macro scale, focusing on long-distance movement of individual goods and empire-wide geographies of transport.[2] This scale certainly represents a logical outcome from the compilation of widely ranging and uneven historical, epigraphic, and archaeological evidence as well as an extensive spatial and chronological breadth. Such an expansive view facilitates inquiry into a central concern of research on in the ancient economy over the past few decades: the structure and institutional functioning of markets for maritime exchange in the Roman Mediterranean (e.g. Bang 2008; Temin 2012). Discussions have long focused of how integrated—or 'modern'—ancient markets were, and to what degree goods and information flowed in reasonably steady and reliable correlations. It is no surprise, then, that the interdependence of networks and markets is an area of growing concern for socioeconomic studies, and that social network analysis can productively inform our approaches to the historical and material evidence of economic phenomena (e.g. Rauch & Casella 2001).

2. E.g. Arnaud 2005; see also the ORBIS project, described by Scheidel & Meeks (2012) and available online at http://orbis.stanford.edu.

Yet while the common lenses for studying Roman connectivity are Mediterranean-wide, it is generally accepted that the most routine economic exchanges in the ancient world—at least in terms of volume preserved in the archaeological record—were overwhelmingly local. Bryan Ward-Perkins (2001: 169) summed up this evaluation of short-haul and long-distance maritime movement of goods for late antiquity: "For every amphora that travelled across the Mediterranean, dozens almost certainly circulated only within a regional economy, and yet more only entirely locally." The social relationships that structured networks governing day-to-day exchange played out primarily on small scales, extending perhaps no farther than individual communities or neighboring settlements. The movement of products within such circles can be difficult to detect and may not have required permanent containers or professional middlemen. In the case of seaborne exchange, long-distance transport is most easily identified through either massive harbor facilities like Portus near Rome or shipwrecks carrying thousands of transport amphoras. Despite this archaeological visibility, the majority of goods surely traveled in small ships, traversing short seas along known coastlines and between socially connected communities.

## Scales of Maritime Network Activity

Against this incongruity between the most celebrated connections of the Roman Empire as a whole and the routine of local maritime exchange, Thomas Tartaron's recent analysis of Mycenaean networks offers a welcome typology as a conceptual tool for appreciating and analyzing precisely such issues of scale (Tartaron 2013: 186 tbl. 6.1). Developing at the most local level are what Tartaron terms "coastscapes", which include the coastal zone and adjacent visual seascape. His "maritime small world" is comprised of many coastscapes connected intimately and routinely through the frequent round trips—of just a couple of days—by fishing vessels and small coastal traders. Together, he argues, these complementary scales of maritime network activity played the most fundamental and under-recognized socioeconomic role in the everyday life of Mycenaean coastal communities. Though developed explicitly for an Aegean Bronze Age context, Tartaron's approach nonetheless provides a useful framework that should also challenge archaeologists and historians to parse carefully the scales of maritime activity that characterized the spatially and quantitatively extensive communication during the Roman era. Distinctions centering on range of operation, size of ventures, and actors involved in exchange has to some extent featured in the famous model of connectivity developed by Peregrine Horden and Nicholas Purcell (2000) who stress the importance of micro-regional variation within a broader Mediterranean fabric. An approach emphasizing regional scales brings to the forefront critical issues regarding the relative roles and variable integration of modes of network activity. What did the different maritime scales look like in the Roman world? To what extent were they integrated into one reasonably functional market for goods shipped across the empire? Did regional and interregional systems of exchange grow directly from the merchants and mechanisms of smaller socioeconomic networks, or did they function on a largely independent scale, with agents and actors creating their own discrete systems?

Even at the height of ancient Mediterranean connectivity, the notion of one pan-Mediterranean market for goods presents something of a problem. Views of Roman transport—in the Edict of Diocletian or along the *stationes* of the Piazzale delle Corporazioni—highlight the hubs and links through which large quantities of goods moved (Arnaud 2005, 2007; Scheidel 2013), but the human relationships and knowledge upon which exchange and markets depended remained constrained by logistics and technology. The inquiry I undertake briefly here centers on detecting a regional scale of network activity—between short-haul commerce and longer-distance flows of goods—and identifying how this regional phenomenon may or may not have interacted with other maritime network scales. Given the scope of the topic and state of the evidence, the discussion here is limited to the broader theory of social network analysis rather than specific formal modeling, although more detailed analytical approaches should eventually be possible. My case study comes from the late Roman period on Cyprus in the northeast corner of the Mediterranean, for which a sufficiently detailed body of evidence is available to distinguish the activity of multiple socioeconomic networks (Fig. 1).

I argue that a distinctly regional scale of seaborne connectivity played a fundamental role in structuring maritime interaction and market formation in the northeast Mediterranean. This network was based on small cargos moving over distances of a few days up to a week or so around and between the island and adjacent mainland. This regionalism of small-scale but routine connectivity involved small ships with minimal crews, cargos of just a few tons, and the unadorned

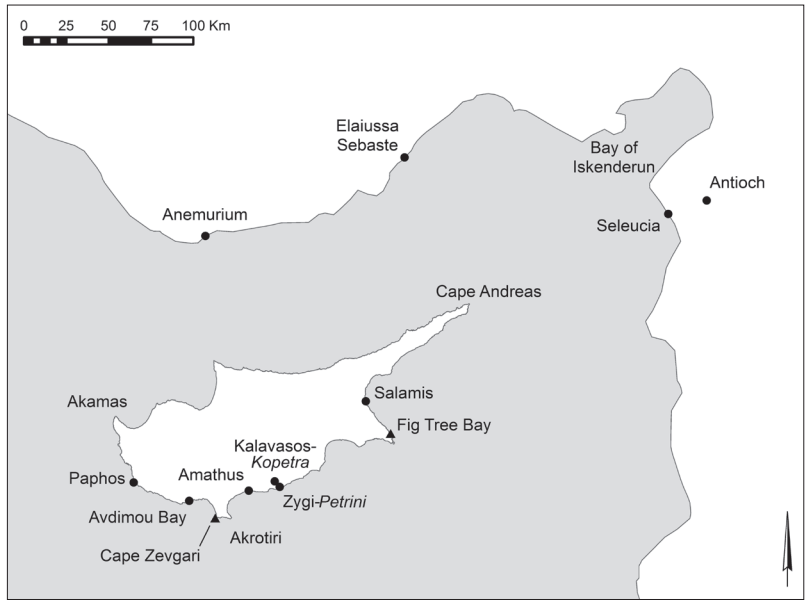



Fig. 1 – Map of the northeast corner of the Mediterranean region showing sites of interest.

beaches and anchorages that served as occasional ports and markets. The unpredictable coastal circuits of cabotage of the sort proposed by Horden & Purcell (2000: 365) as "the basic modality for all movements of goods and peoples in the Mediterranean before the age of steam" surely played a role in this regional network, but so too did direct exchange. For example, merchants who traveled between small beach-side coves in Cyprus and those in Cilicia created a dense network of ties throughout the area and integrated its economic participants into a shared regional market. While individual harbors were surely not entirely independent of larger economic currents that connected the empire, the region appears to have been the most critical scale of network interaction for many communities in this part of the Roman east during late antiquity. What follows outlines in turn the ports, ships, and distances that constituted the nodes and links of this regional network, followed by a brief discussion of the extent to which this scale of activity may have been integrated alongside longer-distance modes of shipping.

## Regional Maritime Network Parameters: Ports, Ships and Distances

Unlike state-driven international exchange involving massive ships and built harbors, regional exchange centered on ports that were little more than coastal beaches where goods could be loaded and unloaded. Often these were coves protected from prevailing winds, but any low-lying shore that was accessible from both land and sea could be suitable, even

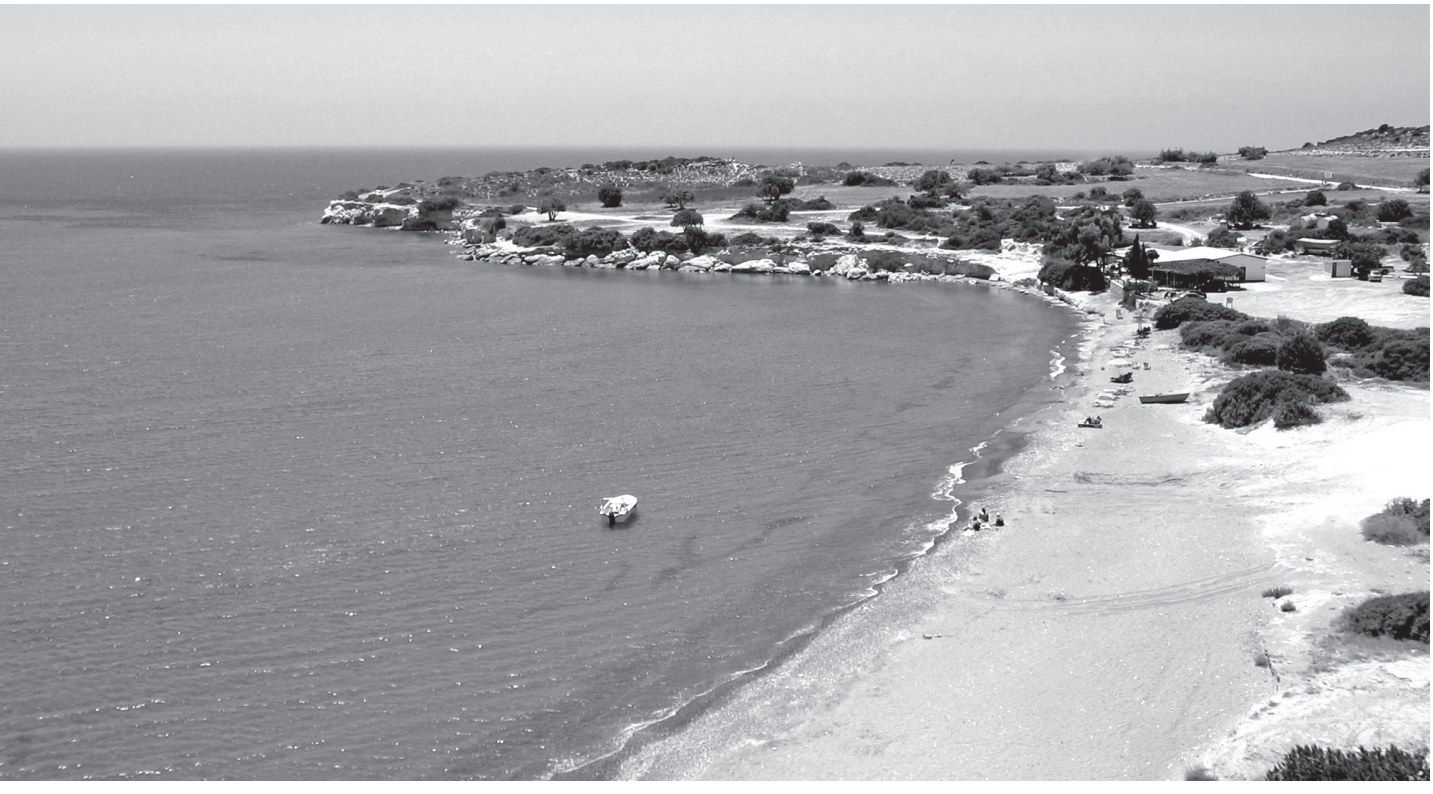


Fig. 2 – View of the beach and anchorage at Avdimou Bay along the south coast of Cyprus.

Fig. 3 – Remains of the small cargo from the Roman shipwreck at Fig Tree Bay off the southeast coast of Cyprus.

in the absence of natural or manmade shelter. Lacking the built infrastructure of harbor walls, these sites are far less conspicuous than the built ports of the larger cities and towns along the coast, and yet they are arguably more numerous. These sites often exhibit scatters of pottery, but the identification of economic activity in this setting can be difficult to determine as surface survey rarely provides substantial evidence for coins, weights, or other such distinctive indicators of exchange. On Cyprus, underwater and coastal surveys have brought to light several locations that probably served in this capacity, particularly during late antiquity. On the basis of ceramics (underwater and on shore), anchors, and topographic suitability, opportunistic ports have been identified at Avdimou Bay (Fig. 2), near Cape Zevgari along west Akrotiri, and at Zygi-*Petrini* (Leidwanger 2013c). Although the routine exchange carried out at these locations required little in the way of infrastructure and no permanent port architecture, these sites nonetheless provided a ready outlet for agricultural produce from the immediate hinterlands and a convenient space for the import of goods. Comparisons between the material records of consumption at settlements served by these sites suggest that the ports were strongly connected not only to other parts of the island, but also to the adjacent mainland; very few imports probably arrived from beyond this circumscribed region.

The utilization of these nearly ephemeral ports around Cyprus appears to have been the business of small-capacity ships. Only a few Roman and late Roman wrecks around the island have been surveyed in sufficient detail to provide estimates of cargo size, and the shallowness of most near-shore sites complicates the reliability of cargo estimates. Detailed survey of the 2nd-century Fig Tree Bay shipwreck off the southeast coast brought to light evidence for 4-5 tons of agricultural goods carried in fewer than 150 amphoras (Fig. 3), the overwhelming majority of which were produced on the neighboring mainland of Cilicia and northwest Syria (Leidwanger 2013a). Another 2nd-century shipwreck off the Akamas peninsula comprised just 50 or more amphoras drawn most likely from the west coast of Cyprus or the opposite shore around Anemurium (Leonard 1995: 144-145). One late Roman shipwreck explored at Cape Zevgari off Cyprus' south coast provides details of what might be a common mode of exchange around the island during the period of interest. This vessel foundered while carrying its agricultural load in perhaps 150 or so jars of probable Cilician manufacture, amounting to no more than 5 tons (Leidwanger 2007: 308-311). Little research has been conducted to date off the island's northern shores, but two late Roman shipwrecks discovered four decades ago at Cape Andreas suggest a similar model: small groups of regional late Roman amphoras most likely from Cilicia and Cyprus, along with some less common products of the area, including in one case bulk terracotta sarcophagi produced on this part of the mainland (Green 1973). Provenience and distribution study of this sarcophagus type attests to the development of a thriving regional market for such a specialty product centered on this corner of the northeast Mediterranean (Parks & Neff 2002).

Sailing distances—marked by the short sea lengths along the coasts and between the Cyprus and the mainland—provide another measure of the scale of network activity. Regional links here need not have included extensive open-water voyages or long durations at sea. Prevailing winds complicated the matter significantly, in general assisting outbound journeys from Cyprus to the mainland and slowing the return trip. In average winds, the short crossing could have been accomplished in a day or two (Fig. 4 and 5). A round trip from nearly anywhere along the island to this coast could have been accomplished easily within a span as little as two or three days up to a week or slightly more. For local coastal traders making stops while

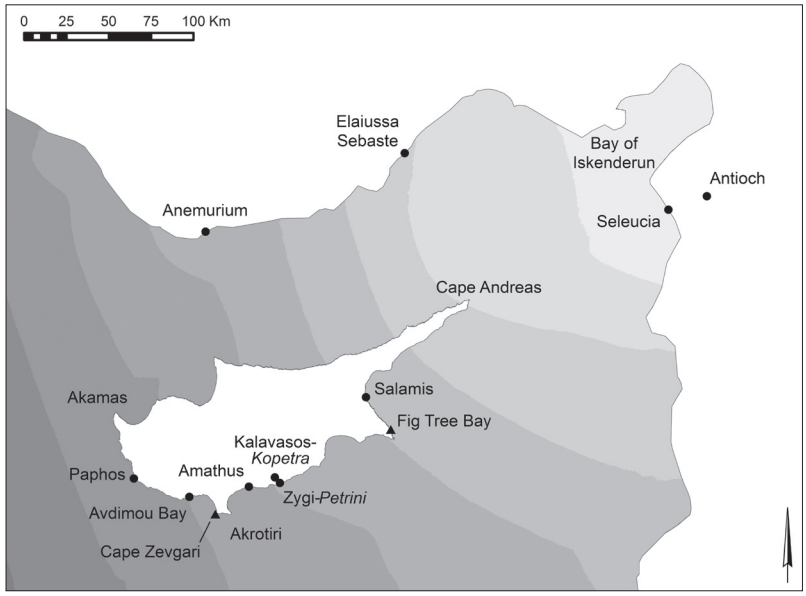



Fig. 4 – Suggested sailing times based on an origin at Seleucia, represented as rings of sailing days using a GIS-driven method described in Leidwanger 2012b.

hugging the shore, short hauls of no more than about 10 km between ports meant just a few hours of sailing at a time and probably no overnights away from shelter.[3] Realistically, journey times were probably somewhat shorter than these figures, at least for certain slower estimates; unlike sailors headed off on long journeys, a small-time mariner traversing these distances probably had more freedom to wait out an unhelpful wind or ominous sky. Taking advantage of the diurnal cycle of on- and offshore winds would sometimes have allowed more progress against the prevailing winds. The opposite shores of Cilicia and Syria have not been explored in detail—at least not with a primary maritime focus—but the few hints of maritime network development suggest again a heavily regional pattern in the circulation of goods.[4]

While small cargos and short hauls have been seen as the norm for maritime transport in antiquity, the tonnages and distances evident from shipwrecks and opportunistic ports off the coast of Cyprus represent an even smaller size and more intensely regional scale of merchant activity than generally acknowledged. In terms of cargo capacity, the vessels appear an order of magnitude lower than the 70-80 tons Lionel Casson (1995: 171) argued for typical small Roman merchantmen. Casson's numbers reflect a perspective derived primarily from historical accounts of the smallest scale of state-sponsored trade, or exchange associated with wider imperial networks. But a picture of even smaller ships, distances of one to several days, and rather limited ranges of operation between Cyprus and the mainland adds a more nuanced economic geography to the flat and scale-free uniformity often portrayed in short-haul exchange. The benefits of merchant ships with limited size and range could have been substantial. They may have been handled by just a few sailors. Their shallow draft would have permitted them safe passage among the shallow coastal waters as well as easy access and quick loading at simple beachside anchorages. Traveling such short distances, in familiar waters and along well-known coasts would have been a key advantage in terms of safety and security. Given the sailing times above, they could have made multiple trips in a week; for the shortest hops, they may have returned in the same day or the next morning.

## Regionalism in Roman Maritime Networks

The ports, ships and distances described above all point to the operation of a network system of dense connectivity on a geographical scale that was at once larger than local but also distinct from Mediterranean-wide exchange and limited to this corner of the Roman world. For those living along and near the coasts of Cyprus, Cilicia and Syria, this pattern of connectivity would have been a fundamental feature of the rhythm of regional economic life, fostering the type of reliable and persistent commerce that formed a background cadence for prosperity in maritime trade. With common trips, and with parties certainly well known to each other, reliable information could flow around the region quite quickly and a considerable level of integration could be achieved on this geographical scale.

Determining the social impact of such integration is another matter. Patterns of consumption provide one possible view, but few assemblages in the late Roman countryside of Cyprus have been quantified sufficiently and in such a way as to shed light on this question. An exception comes from the site of Kalavasos-*Kopetra*, a market town of perhaps 600 inhabitants located up the Vasilikos Valley just inland from the probable opportunistic port at Zygi-*Petrini* noted above. Here, Marcus Rautman has traced the record of imports during late antiquity, revealing that imported amphoras outnumber local Cypriot jars nearly four to one. This proportion is startling for a site that lay outside the island's major commercial ports and should be described as minor at best. The high percentage can be better understood through the clarification that nearly all of the imports are drawn from a restricted area along the neighboring mainland, mirroring the economic geography presented by the network picture above (Rautman 2003: 168-175, 169 tbl. 5.5; Rautman *et al.* 1999; Rautman

3. All sailing times are derived from a GIS-driven method for estimating average voyage durations developed by the author and described in Leidwanger 2013b.

4. For shipwrecks off the Syrian coast, see Kampbell forthcoming. The work of Nicholas Rauh and his collaborators in Cilicia (see Rauh *et al.* 2006) and the excavations at Elaiussa Sebaste (see Ferrazzoli & Ricci 2008) are particularly relevant for studying the economic basis for the development of regional maritime exchange between Cyprus and the mainland; on the underwater survey here, see Ward 2005.

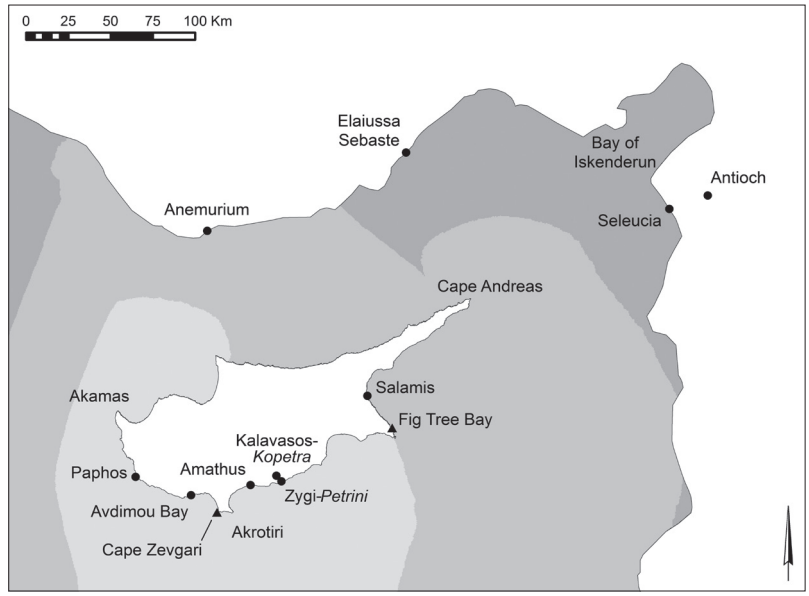



Fig. 5 – Suggested sailing times based on an origin at Paphos, represented as rings of sailing days using a GIS-driven method described in Leidwanger 2012b.

2013). Cyprus' larger port cities record substantial numbers of imports as well—including Amathus, the nearest major harbor to Zygi-*Petrini*—yet assemblages there exhibit a range of materials drawn more widely from not only the island but the whole of the Mediterranean (Kaldeli 2008: 153-158, 238-241 and 500 tbl. 13 and fig. 23). The material evidence points to two distinct spatial networks of maritime exchange centered on different ports, ships, agents, and commodities. Such a picture presents no small difficulty in determining the level of social integration that strictly regional economic connections might have fostered, but it stands to reason that reliable and routine transport was a feature of the maritime landscapes that marked daily life on the island. These small cargos shipped from minor ports might reflect not only the small-scale end of a permanent and distinct class of merchant mariners but also the occasional ventures of fishermen and other socioeconomic groups firmly embedded within the extra-urban Cypriot community. Viewed from this perspective, at least some part of regional seaborne exchange might represent a maritime extension of the agricultural economy rather than a specialized group of professional merchant sailors. Through this network, second-tier and smaller agricultural communities were interconnected across the island and throughout this corner of the Mediterranean, laying the foundation for one type of regional economic market.

I would contend that these ports and mariners served as something other than a subsidiary level of the same networks that linked the larger urban coastal hubs, whether on Cyprus or across the broader Mediterranean. The operation of a regional maritime economy was dependent on particular economic agents, communities, vessels, goods and mechanisms, many of which may have been appropriate for only this scale of maritime circulation. The same logic and evidence suggest that regional networks also need not reflect a natural outgrowth of the most local Cypriot coasting patterns—a "scaling up" of the individuals and infrastructure that worked on a local level. Yet some of the simple beachside anchorages discussed above may have also served this most local of exchange, raising the possibilities for some level of integration—or at least intersection—of economic networks on local and regional scales. If we are to appreciate and analyze the complexity of the Roman maritime economy, then a network-based approach must emphasize this diversity of scales and allow exploration of their integration.

The pan-Mediterranean scale of network analysis of the Roman maritime connectivity is critical for investigating issues of integration and information flows within the context of one of the ancient world's most massive economic systems. Viewed through the lens of economic regionalism, the Roman Mediterranean can be characterized not only by the distinct geographies of network activity but by the different models and mechanisms particular to each network scale. The interplay of these scales serves as an index for investigating a particularly problematic issue of the ancient Mediterranean economy: the possible role of markets and market development across the ancient world. Rather than revealing a single integrated "trade network" in the Roman Mediterranean, this approach suggests multiple intersecting regional and inter-regional networks centered on distinct products, ships, agents, communities, and mechanisms.

*Acknowledgments*

Thanks are due to Carl Knappett and the journal editors for the invitation to participate in the volume. The ideas presented here owe a significant debt to productive exchange with various colleagues over the past few years, especially Elizabeth S. Greene, Carl Knappett, Walter Scheidel, and Thomas Tartaron.

## References

Arnaud P. 2005. *Les routes de la navigation antique: itinéraires en Méditerranée*. Paris, Éditions Errance.

— 2007. «Diocletian's Prices Edict: the prices of seaborne transport and the average duration of maritime travel», *Journal of Roman archaeology*, 20: 321-336.

Bang P. F. 2008. *The Roman bazaar: a comparative study of trade and markets in a tributary empire*. Cambridge, Cambridge University Press.

Brughmans T. 2013. «Thinking through networks: a review of formal network methods in archaeology», *Journal of archaeological method and theory*, 20: 623-662.

Casson L. 1995. *Ships and seamanship in the ancient world*. Baltimore, Johns Hopkins University Press.

Ferrazzoli A. F. & Ricci M. 2008. «Gli scambi e le rotte commerciali nel bacino del Mediterraneo orientale in epoca romana e primo bizantina sulle base del materiale anforico proveniente dallo scavo di

Elaiussa Sebaste in Cilicia (Ayash, Turchia)», *in*: J. Pérez Ballester and G. Pascual Berlanga (ed.), *Comercio, redistribución y fondeaderos: la navegación a vela en el Mediterráneo*. Valencia, Universidad de Valencia: 521-530.

Green J. 1973. «An underwater archaeological survey of Cape Andreas, Cyprus, 1969-70: a preliminary report», *in* D. Blackman (ed.), *Marine archaeology*. Hamden, Archon: 141-179.

Horden P. & Purcell N. 2000. *The corrupting sea: a study of Mediterranean history*. Oxford, Blackwell.

Kaldeli A. 2008. *Roman amphorae from Cyprus: integrating trade and exchange in the Mediterranean*. PhD thesis. London, University College London.

Kampbell S. M. Forthcoming. «Shipwrecks of the Syrian coast», *International journal of nautical archaeology*, 42: 419-425.

Knappett C. (ed.). 2013. *Network analysis in archaeology: new approaches to regional interaction*. Oxford, Oxford University Press.

Leidwanger J. 2007. «Two late Roman wrecks from southern Cyprus», *International journal of nautical archaeology* nº 36: 308-316.

— 2013a. «Between local and long-distance: a Roman shipwreck at Fig Tree Bay off SE Cyprus», *Journal of Roman archaeology* nº 26: 191-208.

— 2013b. «Modeling distance with time in ancient Mediterranean seafaring: a GIS application for the interpretation of maritime connectivity», *Journal of archaeological science* nº 40: 3302-3308.

— 2013c. «Opportunistic ports and spaces of exchange in late Roman Cyprus», *Journal of maritime archaeology* nº 8: 221-243.

Leonard J. R. 1995. «The anchorage at Kioni», *in* J. Fejfer (ed.), *Ancient Akamas, Vol. 1, settlement and environment*. Aarhus, Aarhus University Press: 133-170.

Parks D. A. & Neff H. 2002. «A geochemical vector for trade: Cyprus, Asia Minor, and the Roman East», *in*: M. D. Glascock (ed.), *Geochemical evidence for long distance exchange*. Westport, Bergin and Garvey: 205-214.

Rauch J. E. & Casella A. (ed.). 2001. *Networks and markets*. New York, Russell Sage Foundation.

Rauh N. K., Dillon M. J., Dore C., Rothaus R. & Korsholm M. 2006. «Viticulture, oleoculture, and economic development in Roman Rough Cilicia», *Münstersche Beiträge zur antiken Handelsgeschichte*, 25: 49-98.

Rautman M. L. 2003. *A Cypriot village of late antiquity: Kalavasos*-Kopetra *in the Vasilikos Valley*. Portsmouth, Journal of Roman Archaeology.

— 2013. «Late Roman amphorae and trade in the Vasilikos Valley», *in* M. L. Lawall & J. Lund (ed.), *Transport amphorae and trade of Cyprus: proceedings of a seminar at the Danish Institute at Athens, 23-24 April 2007*. Aarhus, Aarhus University Press: 191-199.

Rautman M.L., Neff H., Gomez B., Vaughan S. & Glascock M. D. 1999. «Amphoras and roof-tiles from late Roman Cyprus: a compositional study of calcareous ceramics from Kalavasos-Kopetra», *Journal of Roman archaeology*, 12: 377-391.

Scheidel W. (ed.). 2012. *Cambridge companion to the Roman economy*. Cambridge, Cambridge University Press.

— 2013. «Explaining the maritime freight charges in Diocletian's Prices Edict», *Journal of Roman Archaeology*, 26: 464-468.

Scheidel W. & Meeks E. 2012. «ORBIS: the Stanford geospatial network model of the Roman world», [http://orbis.stanford.edu], 21 December 2013.

Tartaron T. F. 2013. *Maritime networks in the Mycenaean world*. Cambridge, Cambridge University Press.

Temin P. 2012. *The Roman market economy*. Princeton, Princeton University Press.

Terpstra T. 2013. *Trading communities in the Roman world: a micro-economic and institutional perspective*. Leiden, Brill.

Ward C. 2005. «Dağlık Kilikia Deniz Kıyısı Arkeolojisi Projesi: ön rapor 2004/Rough Cilicia Maritime Archaeological Project 2004: a preliminary report», *Anadolu Akdenizi Arkeoloji Haberleri* 2005, 3: 126-130.

Ward-Perkins B. 2001. «Specialisation, trade and prosperity: an overview of the economy of the Late Antique eastern Mediterranean», *in* S. Kingsley & M. Decker (ed.), *Economy and exchange in the east Mediterranean during Late Antiquity*. Oxford, Oxbow Books: 167-178.

# Sommaire



Éditions de la maison des sciences de l'homme

12 euros ISBN : 978-2-7351-1701-7