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# Archaeology and Economy in the Ancient World

3

## The Ancient City and Nature's Economy in Magna Graecia and Sicily

Panel 2.1

Johannes Bergemann
Mario Rempe (Eds.)

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# Proceedings of the
# 19th International Congress of Classical Archaeology

## Volume 3: The Ancient City and Nature's Economy
## in Magna Graecia and Sicily

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**Edited by**

**Martin Bentz and Michael Heinzelmann**

**Volume 3**

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# PREFACE

On behalf of the 'Associazione Internazionale di Archeologia Classica (AIAC)' the 19th International Congress for Classical Archaeology took place in Cologne and Bonn from 22 to 26 May 2018. It was jointly organized by the two Archaeological Institutes of the Universities of Cologne and Bonn, and the primary theme of the congress was 'Archaeology and Economy in the Ancient World'. In fact, economic aspects permeate all areas of public and private life in ancient societies, whether in urban development, religion, art, housing, or in death.

Research on ancient economies has long played a significant role in ancient history. Increasingly in the last decades, awareness has grown in archaeology that the material culture of ancient societies offers excellent opportunities for studying the structure, performance, and dynamics of ancient economic systems and economic processes. Therefore, the main objective of this congress was to understand economy as a central element of classical societies and to analyze its interaction with ecological, political, social, religious, and cultural factors. The theme of the congress was addressed to all disciplines that deal with the Greco-Roman civilization and their neighbouring cultures from the Aegean Bronze Age to the end of Late Antiquity.

The participation of more than 1.200 scholars from more than 40 countries demonstrates the great response to the topic of the congress. Altogether, more than 900 papers in 128 panels were presented, as were more than 110 posters. The publication of the congress is in two stages: larger panels are initially presented as independent volumes, such as this publication. Finally, at the end of the editing process, all contributions will be published in a joint conference volume.

We would like to take this opportunity to thank all participants and helpers of the congress who made it such a great success. Its realization would not have been possible without the generous support of many institutions, whom we would like to thank once again: the Universities of Bonn and Cologne, the Archaeological Society of Cologne, the Archaeology Foundation of Cologne, the Gerda Henkel Foundation, the Fritz Thyssen Foundation, the Sal. Oppenheim Foundation, the German Research Foundation (DFG), the German Academic Exchange Service (DAAD), the Romano-Germanic Museum Cologne and the LVR-LandesMuseum Bonn. Finally, our thanks go to all colleagues and panel organizers who were involved in the editing and printing process.

Bonn/Cologne, in August 2019

Martin Bentz & Michael Heinzelmann

# The Ancient City and Nature's Economy in Magna Graecia and Sicily – Introduction

**Johannes Bergemann – Mario Rempe**

In his preface to the second edition of *Nature's economy. A history of ecological ideas*[1] D. Worster describes the "economy of nature"[2] as a "point of view that sought to describe all of the living organisms of the earth as an interacting whole"[3]. Scholars of different fields and of different academic backgrounds have offered numerous views and hypotheses on historic human-environment relations in recent times. For landscape archaeologists questions concerning the ancient economy cannot be answered without taking into account the economy of nature. Our panel dealt with the interaction of ancient cities with their environmental surroundings. Reconstructions of cities, their landscapes, and paleoenvironments in Magna Graecia and Sicily have been presented, offering a wide repertoire of methods and giving insights into various aspects of human-environment interaction.

Speakers aimed at creating a more detailed vision of the historical development of their research area by interweaving environmental and socioeconomic changes in their presentations. Although comprehensive studies, which consider the environment and landscape change in southern Italy and Sicily, are still rather an exception, the papers could demonstrate the potential of an interdisciplinary approach to an ancient city and its territory.

A. M. Mercuri showed how different pollen analyses create pictures of cultural landscapes and man-made changes to the environment in south Italy and Sicily, focusing especially on methodology. J. Bergemann highlighted in his paper how natural resources in different parts of the Mediterranean affected cities and societies, giving insights into his research in Attica, Gela, Agrigento, and Camarina. M. Rempe built on one of the Sicilian examples, offering a case study of Camarina with focus on landscape change and paleoenvironment in connection to the Göttingen survey. E. Mango demonstrated how a city inserts itself into the landscape and how natural surroundings shaped settlement features of Himera. The paper of A. Burgio and Oscar Belvedere emphasized the role of geomorphological processes and different vegetation and land-use schemes in different Sicilian regions. R. Chowaniec portrayed the exploitation of the territory of Akrai, looking at several aspects of daily life and consum, using a wide range of methods. A. P. Mosca gave an insight into the diachronic development of the Lilybaeum area with special regard to exploitation sites and water resources.

Obviously, the panel did not aim at delivering a comprehensive overview of all archaeological investigations that include environmental aspects and paleoenvironmental reconstructions in southern Italy and Sicily. Over the last decades, research in this field of study has grown intensively, thus producing a vast bibliography, including the regions

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of southern Italy and Sicily.[4] It was rather our idea to give insights into environmental aspects in connection to economic questions and to settlement dynamics as highlighted by some of the ongoing archaeological investigations in Magna Graecia and Sicily.

## Notes

[1] Worster 1994.

[2] Worster 1994, X.

[3] Worster 1994, X.

[4] See for example Attema et al. 2010; Bergemann 2010; Belvedere 2002; De Haas – G. Tol 2017; La Torre – Toscano Raffa 2016; Seiler et al. 2010; Vermeulen et al. 2017; see also the contributions on Italy and Sicily in Bergemann – Belvedere 2017 and Vermeulen 2012.

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## Abstracts

### Palynological Approach to the Economy and Human Impact Reconstruction. Examples from the Greek Colonial System (Metaponto area) and Roman Agrarian Settlements (Central Sicily)

Anna Maria Mercuri

Archaeopalynology and archaeobotany are among the key disciplines in the understanding both present-day landscapes and past human-environment relationships.

In archaeological contexts, plant remains help to recognize different types of land use: a) exploitation of plant resources; b) cultivation, i.e. the planting and care of useful plants; c) breeding leading to the increase of pastures and selection of unpalatable plants by animal browsing; d) settlements with spreading of ruderal and nitrophilous plants. Pollen and non-Pollen palynomorphs (a set of other microscopical records of biological origin, mainly including fungi and algae) are especially useful to discriminate these types of actions.

In the Metaponto area, the palynological research has been carried out on samples collected from archaeological contexts, mainly farmhouses and rural settlements of the Greek colonization. Pollen analysis allowed for local reconstructions in an area with over 700 rural sites. This improved the knowledge of plant species present and/or used in the sites, and environmental and land-use changes during the Greek phase of occupation, as several sequences were analyzed, thus creating a much broader pollen signal.

In central Sicily, pollen analyses on the Roman farmhouse and rural settlements have been particularly worthwhile for palaeoenvironmental/economical local reconstructions. Sequences have been extracted from horizontal and vertical stratigraphies. Our data evidences intense land exploitation that contributed to transforming the natural environment of the island into the cultural landscape of the early modern central Mediterranean. This was further validated by taking into account archaeobotanical remains.

### Culture and Nature in Landscape

Johannes Bergemann

Three survey projects in Gela, Agrigento, and Camarina (Sicily) have led to the result that ancient economic life must be considered as a complex system. The impact of nature and natural factors like moving coastlines or depleted soil on human life became evident. The paper addressed the influence of natural resources on the ancient settlements, their cultures and economies in different regions of the Mediterranean, giving examples from the Göttingen research in Attica and Sicily. A further concern of the contribution was a possible sustainable behavior of the Greek and Roman settlers.

### The Chora of Camarina from Archaic to Roman Times. A sustainable Cultural Landscape?

Mario Rempe

Within the scope of the Göttingen survey of the Camarina Chora (southeastern Sicily), changes in the settlement patterns are demonstrable, especially between the Greek and Roman era. The Greek settlers did plainly use other places and pockets within the landscape and environment. Several palaeo-environmental approaches were carried out to check if the change of settlement patterns coincides with changes within the cultural landscape and/or natural disaster. The talk focused on physical changes on the landscape, as it considered the development of the fluvial terraces and the effects of land use and erosion. In connection with these changes the results of a pollen core, which was taken in the middle of the Greek chora, has been presented and discussed with regard to economic and ecological changes.

### Ancient Landscapes and Economy in the District of Northern Imera River (Sicily), from Prehistory to Early Medieval Times. A Comparative Analysis with the Cignana Hinterland (Agrigento, South Sicily)

Oscar Belvedere – Aurelio Burgio

The paper presented the palaeo-environmental approaches and preliminary results in the area of northern Imera river, corresponding to the territory of the ancient cities of Himera (destroyed in 409 BC) and Thermae Himeraeae (founded in 407 BC). The area is located in the northwest of Sicily, and it is mainly characterized by hilly landscape crossed by rivers facing the Thyrrenian Sea, and by a mountainous landscape (the Madonie) on the eastern side.

Comparing the results of the archaeological excavations (in the city of Himera, and in the rock-shelter of Vallone Inferno), with topographical and palaeo-environmental analysis (both in the northern Imera River and in the Madonie), relevant aspects were taken into consideration. The speakers discussed the ancient habitation area and human activities in the coastal area as well as in the hilly and mountainous contexts south and east of the Himera, from prehistory to Late Antiquity.

Strong erosion is well recognizable inside the city of Himera and in the surroundings. It is possible that it has originated in late-Archaic and Classical ages, maybe connected to human activities. Further transformations of the territory occurred during Late Antiquity and early Medieval Age.

Moreover, a preliminary comparative analysis with the area of Cignana, a hilly site near the coast in southern Sicily, east of Agrigento, was offered.

### Topographical and Urbanistic Considerations Regarding Himera. New Evidence from the Piano del Tamburino

Elena Mango

This paper presented work carried out by the University of Bern in collaboration with the Archaeological Park of Himera since 2012. Our research has thrown new light and importance on the area of the colony of Himera referred to as the Piano del Tamburino, an area that has received little attention in the more than 50 years of research at Himera.

Following an initial extensive study of the morphology and topography of the Piano del Tamburino with investigations employing remote sensing, surveys and various geophysical methods (geomagnetic, geoelectric, electric tomography, georadar), excavations commenced in 2012. The results to date from this multidisciplinary approach have provided new insights about the environment and development of the Piano del Tamburino, especially regarding the aspects of the interactions between the natural surroundings and the ancient polis, between different urban spaces and social activity zones, all of which contribute to a new understanding of the cultural landscape of the city. The rivers around the site form fluvial landscapes and are important for many processes like transport and production. This is of special significance given Himera's unique geographic location on the northern shore of Sicily with its orientation toward the Tyrrhenian Sea and its trade with the Phoenicians and the Etruscans. Moreover, its ethnic and cultural context – situated at the crossroads of various spheres of interest – in an indigenous Sican territory near the Phoenician cities of Soluntum and Palermo needs to be highlighted in this regard.

### Living around Lava Flows and Volcanic Mud Lakes: Settlement and Landscape Transformations in the Western Slopes of Etna from the Early Iron Age to Classical Times

Massimo Cultraro

The western slopes of the Etna represent an area of interest for investigating the interaction of settlements and environment in a long-term perspective. Intensive survey activities carried out in the last thirty years have provided a reliable source of data for examining settlement dynamics from prehistory onwards. The main questions arise around the long-term activity of Etna and its impact on the ancient landscape, natural as well as human. Although a huge number of publications on the volcanic evidence of this area has been produced, comprehensive studies on the relationships between human settlement and environmental transformations are rare.

The paper aimed at reconstructing the different levels of interaction between human communities and their environmental surroundings. Evidence of Lake Gurrida (Randazzo), located at 835 m. above sea level, won by multiproxy investigations leading to a reconstruction of paleoenvironmental dynamics, indicating that the early Iron Age (1100–800 cal. BC) was more arid than the preceding Bronze Age.

Changes in the human landscape related to the volcanic events can be visualized as well. Moreover, specific volcanic phenomena had an influence on the religious system of the local communities.

### Faunal and Botanical Assemblages in *Akrai*/*Acrae* (south–eastern Sicily) from Late Hellenistic Period to Late Antiquity. Paleoenvironmental and Food Circulation Reconstruction

R. Chowaniec

The paper presented the recent studies on the faunal and botanical assemblages discovered during the new archaeological excavations in ancient *Akrai*/*Acrae*, located in southeastern Sicily. The paleoenvironmental and food circulation reconstruction is based on the recent research done at the Greek colony, founded by Syracuse in 664/663 BC and developed for centuries, with an intense architectural boom in the second half of 3rd cent. BC. After the fall of the mother-colony in 212 BC, the town becomes a part of the Roman province and was frequented till late Antiquity/Byzantine period. The osteological, archaeobotanical, lipid and stable isotope analyses along with the observation of archaeological artifacts, allow observing changes in the exploitation of natural resources and culinary preferences.

### Natural Environmental Factors and Human Settlement in Western Sicily: the Example of Lilybaeum

Annapaola Mosca

The paper focused on relationships between environmental factors and human settlement in Western Sicily from the 5th century BC until Late Antiquity in the area around the main urban center of Lilybaeum. The interdependence between cultural landscape and natural environmental factors has been analyzed within the wider scope of archaeological surveys. Coastal lagoons and ponds, wells of drinkable water, quarries, fertile soil and specific types of vegetation have characterized the organization of ancient settlement in the area between Lilybaeum and Mazara del Vallo. Particular cultures, like small palms growing on rocky soil, but also wheat, olive trees, and vineyards have played an important role in the inland economy. The opportunity to practice herding due to the proximity of the mountain pastures of Erice has also contributed to the formation of the ancient settlement.

But, above all, the presence of the ports of Lilybaum and at the Mazaro river and the possibility of trade with North Africa due to the proximity to the African coasts probably influenced wealthy owners in choosing this Sicilian area to build their estates. Through archaeological data, we can understand settlement changes over the centuries, until the apparent loss of importance of the settlement after the Vandal period.

# Sustainability in Antiquity? Archaeological Data from Attica and Sicily

**Johannes Bergemann**

Classical archeology was established in the 18th century as a science of ancient art.[1] Of course, at the beginning of the 21st century, it developed into a much broader science of the material legacies of antiquity, focusing on structures, cities, cemeteries, and sanctuaries while taking into account environmental factors,[2] the natural influences on settlements and economics and even on the great Greek colonization.[3] Landscape Archeology looks at ancient settlements and economic forms on a large scale and addresses the environmental influences in cooperation with the natural, geoscience and landscape sciences.[4]

It is clear that natural space has had a decisive influence on ancient civilizations. The Greek culture with its tiny states, Poleis, would be inconceivable without the sea and its many islands. In addition, even individual islands are often divided into different poleis. The marble sculpture, which can be considered a fundamental phenomenon of ancient material culture and art, and the marble temples would not have been possible without the exploitation of various marble deposits on the islands[5] and in mainland Greece.[6]

The Greek pictorial art and the myth also thematized the natural foundations of the poleis. In the western pediment of the Parthenon, the dispute between the gods Athena and Poseidon for the possession of Attica is shown. This is one of the founding myths of the Attic polis, which due to the powerful position of the city gains new relevance in the 5th cent. BC and was iconographically conceived in a new way. The quarrel is carried out in the manner of a Greek competition (agon) with the gifts of nature: Poseidon hits with his trident a spring of salty water, while Athena plants an olive tree.[7] Both divine acts were worshiped at the Erechtheion on the Acropolis.[8] Of course, Athena won the competition, because the olive tree has been the dominant crop of Attica since ancient times. Nature gives the guidelines for human development. Spiritual and religious ideas evolve not least around natural resources.

## Sustainability and Archaeology

However, sustainability describes an even more complex relationship between man and nature. In Greco-Roman antiquity, a word for sustainability was missing. It came into being only in the 18th century,[9] and nowadays it finds an unexpected frequent use in different contexts.[10] Sustainability is required not only for dealing with the resources of nature, but also for social interaction and much more. However, literary sources have confirmed that the idea of conserving resources already existed in antiquity.[11]

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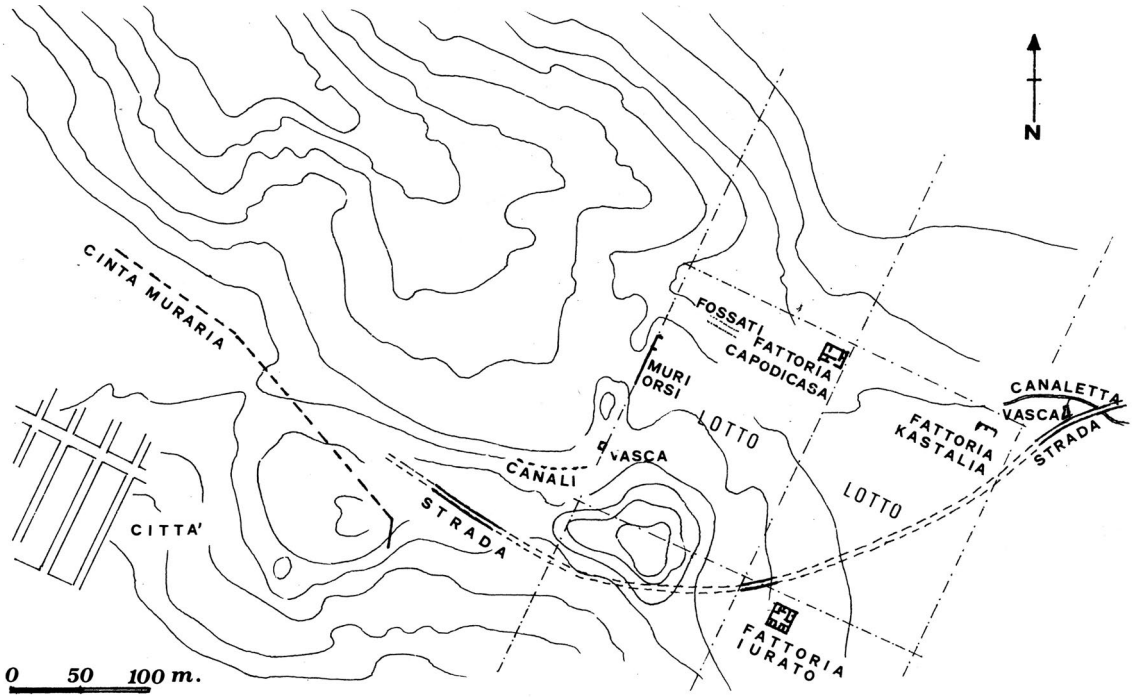


Fig. 1: Lots in the Chora of Camarina.

In the archaeological literature, as collected in the most complete bibliography (www.dyabola.de), in fall 2018 the German term "Nachhaltigkeit" comes up only once, related to building physics concepts for museums.[12] The English word "sustainability", however, is already found five times.[13] Of course, the use of the terminology "sustainability" in the archeological literature is growing rapidly. Only a few months ago, the German version was lacking at all, the English only found once.

## Sustainability, Romanticism and Cultural Criticism

For the ancient world, one would, therefore, have to start from a rather simple concept of sustainability, in essence, that of the 18th century: Was there a discourse on how one could use natural resources in such a way that these were available in the long term? Naturally, the discourse will be less visible from the archaeological and material sources than from the outcomes and results. One might ask whether Greco-Roman antiquity was able to sustainably manage natural resources in this sense. However, it cannot be a matter of romanticizing early societies or of declaring the ancients sustainable by necessity. A conceivable alternative would have been that the ancient cultures had failed to act sustainably, that the discourse on sustainable economics had failed or not been conducted at all. Especially Roman antiquity is often assumed to have caused the

Fig. 2: Bellaccio, Farm and necropolis.


Fig. 3: Bellaccio, black gloss and louterion.

Fig. 4: Torre Piombo, probable Roman villa.

deforestation of large parts of the Mediterranean through shipbuilding or the excessive use of firewood in the thermal baths. In a culture-critical approach, the Roman Empire is more likely to be seen as a destroying force to the environment.[14]

## Overexploitation and Sustainability in the Attic Mining District of Laureion

An important economic resource of classical Athenian democracy was the silver of Laureion. It was obtained in shafts in south Attica and processed in numerous laundries and smelting furnaces.[15] The landscape in south Attika was until a few decades ago characterized by macchia and lack of forest, while in early times undoubtedly forests were present.[16] It is unclear when the forest has disappeared. It is clear, however, that the processing of silver ore and the extraction of silver in ancient times required large quantities of water and wood. For example, large concentrations of laundries can be found in the Soureza and Agrileza valleys, as well as in the Berzeko valley and in Thorikos itself. In Thorikos one can study how the laundries were designed and placed. On the one hand, there were silver deposits, because in the immediate vicinity there were shafts for the extraction of ore. At the same time, however, the situation in sloping valleys was extremely favorable for the collection of water from the slopes. It was kept in large cisterns, each providing for a laundry.[17]

Fig. 5: Torre Piombo, italian and african terra sigillata.

However, there is only one 5th century BC furnace in this area. Altogether only three or four furnaces are known. In the 4th century BC, the smelting was done at the coast. An example of this is the bay Panormos between Thorikos and Sounion. Above the beach, on a rocky ridge, several kilns for silver smelting were installed. Only a few meters away, in the flat beach water, to this day various walls are visible, that should belong to the harbor. Further smelting furnaces are known near Thorikos in the Frangkolimani and south of today's Lavrio on the peninsula Oxygono.[18] It was possible to import wood from woody regions, e.g. from northern Greece and to operate the silver kilns. A little further inland was a large peristyle, perhaps an agora for the sale of the goods.[19]

This results in a picture of a sustainable water use and an unsustainable wood industry. The water could only be used in the quantities available through the winter rains. Therefore, the water was handled with great care, collected in the cisterns, and used several times by taking it out of the circuit of the ore washery at the end, in order to use it again, probably several times. The water was sustainably managed. Not so, the wood, which must have been exhausted quickly after the beginning of the silver industry, so that one relied on imported wood. Therefore, the smelting was moved to the shores, where the wood could be landed with ships.

Fig. 6: Carnala, Roman village.

## Göttingen Archaeological Survey Projects in Sicily and Sustainability

Landscape Archeology has evolved into a tool ideally suited to answer questions regarding the economy, sustainability, and landscape change. The University of Göttingen has conducted several archaeological surveys in Sicily. While in Gela an archaeological pottery survey was carried out, enriched by geological investigations of coastal change and scientific analysis of some of the collected materials.[20] In the hinterland of Agrigento[21] and Camarina[22] geophysical investigations were carried out additionally; in Camarina paleobiological research took place as well. Within the framework of the Göttingen project "Sustainability as an argument: sufficiency, efficiency, and resilience


Fig. 7: Carnala, african terra sigillata.

as parameters of anthropogenic action in history", the results of the mentioned projects were augmented with the aspect of sustainability.

## Settlement Shift from Greek to Roman Times in the Hinterland of Camarina

In the surroundings of Camarina (founded 599 BC) in 461 BC the ownership of the land has been redistributed, according to historical sources. On this occasion, a regular division of land was implemented, whose rectangular lots were aligned with streets and covered a part of the country close to the city (fig. 1).[23] In the area close to the city, this resulted in a very dense land use, almost every 200 m there is a site, mostly individual farms and associated necropolises like in the location Bellaccio (fig. 2. 3). This dense settlement of the Camarina countryside dates mainly to the 5th and 4th centuries BC, given the pottery evidence. After that, the density of sites in this area is decreasing dramatically, falling from the 4th to the 3rd century BC from 20 to only 10 occurrences of the 3rd to 1st century BC. This is connected on the one hand to the end of the city of Camarina in the 3rd century BC and its destruction in the First Punic War. As in other cities on the south coast of Sicily, namely in Gela, the settlement of the surrounding area after the abandonment of the urban centers is significantly reduced.[24]

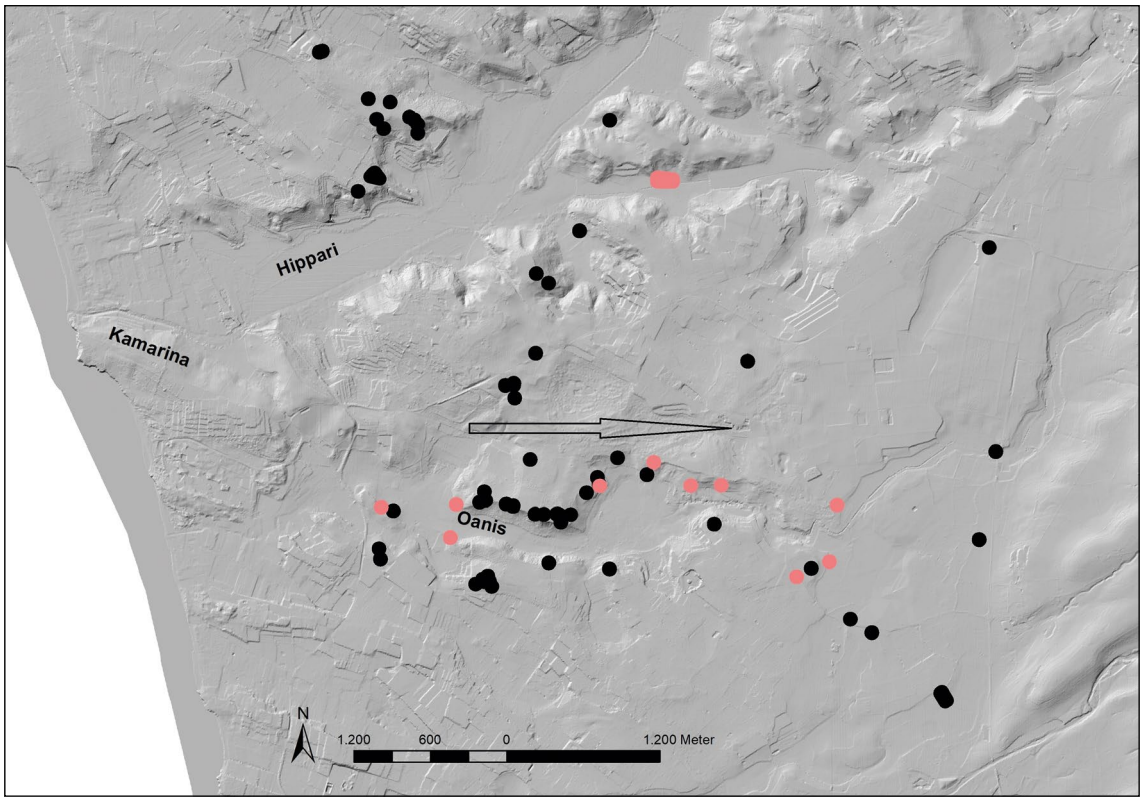


Fig. 8: Camarina Chora: black gloss (black), terra sigillata (pink).

Nevertheless, there is another possible explanation. Instead of the gridded, regular land distribution of the 5th and 4th centuries BC in Roman times, a new settlement system developed, which is based on villae rusticae and village settlements and established farther away from the coast at the foot of the Hyblean mountains. A good example is the site Torre Piombo (fig. 4. 5)[25], where since the early Imperial period on the upper edge of the Oanis valley a small area with a high proportion of terra sigillata was located, thus probably a villa rustica. A little further inland a village settlement at Casa Carnala (fig. 6. 7)[26] is situated. On the ground there was a dense scatter of the Roman period with high proportions of roof tiles and terra sigillata, as is common elsewhere for Roman vici. Years ago, a wall was uncovered there. Subsequently, a complex settlement structure with several buildings and streets could be determined in the geomagnetic image. At a short distance, moreover, the necropolis belonging to the settlement was excavated.[27] It must be a larger rural settlement, which existed from Hellenistic times to Late Antiquity. Overall, the number of sites has increased from Hellenistic times slightly to 14, but there are only six major sites, while the other sites have no residential aspects, perhaps barns or other agricultural facilities.

The Greek homesteads are located close to the town of Camarina on the low flat plateaus between the rivers Oainis and Ippari, which also flank the city hill of Camarina. This area is quite small divided by the 20 to 30 m deep river valleys. The Roman settlements, on the other hand, lie further inland at the foot of the Hyblean Mountains and the long rise of their plateau (fig. 8). There, the land is flatter, the brooks are hardly cut into the terrain so that a large-scale agriculture could be operated at a time when there was no urban center in the area anymore. Proper cities existed at that time in Syracuse and Catania, both over 100 km away. The villa and the *vicus* had become the dominant living environments in these areas, far away from urban culture.

However, it is questionable whether this displacement of the settlements in the Camarina area from Greek to Roman times from the coast to the inland, and from the more articulated small-scale areas to the large plains, is due solely to a change in agriculture. Possibly the use of soils in the immediate vicinity of Camarina had already led to an exhaustion of fertility in Hellenism and eventually this was due to an overuse of soils in the 5th and 4th centuries BC. In this case, one would have to speak of a lack of sustainability and a lack of discourses on sustainability in the Greek society of the city of Camarina.

Whether we are dealing with an over-exploitation of soils during the Greek Classical period, or simply with a change in agricultural practices and a shift in settlements following the end of the urban center of Camarina, Mario Rempe's contribution will examine, using archaeological and interdisciplinary methods.

## Notes

[1] Graepler – Migl 2007; Graepler 2014, 75–108.

[2] Bintliff 2012; Bergemann 2020.

[3] Posamentir in print.

[4] Bintliff 2012, 270–284; Attema 2017, 426–435; Bergemann – Belvedere 2017; Kluiving – Guttmann-Bond 2012.

[5] Tambakopoulos – Maniatis 2017, 468–482; Schneider 2015, 215–237.

[6] Korres 1995, 1–5; Korres 1992.

[7] Meyer 2017, 119–131; Patay-Horváth 2002, 119–129.

[8] Pirenne-Delforge 2010, 147–163.

[9] von Carlowitz 1713, 105.

[10] Ekardt 2016.

[11] Scheer in print.

[12] Exner – Jakobs 2005.

[13] Marston 2017; Nikolova 2017, 19–25; Citter 2015, 253–272; Bintliff 2014, 319–326; van der Leeuw 2012, 45–58.

[14] Boyle et al. 2011.
[15] Konophagou 1980; Jones 1982, 169–183; Goette 2000; Kakabogiannes 2005.
[16] Renault-Miskovsky 1981, 633–647; Kouli 2009, 43–51; Kouli 2012, 267–278. For advice on this I have to thank S. Brandt (Göttingen).
[17] Liefferinge 2013, 109–126.
[18] Konophagos a. O. (Anm. 15) 274–303 Abb. 11, 1–12; 12, 1–20; Jones a. O. (Anm. 15) Abb. 6; Goette a. O. (Anm. 15) 104–106 Abb. 138–140 Beil. 1; Kakabogiannes a. O. (Anm. 15) 261 f.
[19] Goette a. O. (Anm. 15) 63 f.
[20] Research at Gela was carried out with the permission of the Sopraintendenza of Caltanissetta. The budget was given by Fritz-Thyssen-Stiftung, Köln, and DFG.-Bergemann 2010.
[21] Research in the hinterland of Agrigento was carried out with the permission of the Soprintendenza of Agrigento. The budget was given by Gerda Henkel Stiftung, Düsseldorf.- Publication in preparation.- Bergemann 2012, 98–103 Abb. 1. 2 Taf. 7–9,1; Bergemann 2015, 341 f. Abb. 19, 4–7; Bergemann 2013, 71–74 Abb. 3. 4; Bergemann 2014, 376–378 Abb. 3–5; Bergemann 2017; Blasetti Fantauzzi 2017, 113–122; Klug 2017, 123–136.
[22] Ongoing research at Camarina is carried out with the permission of Polo Museale di Ragusa, Museo Regionale di Camarina and Sopraintendenza of Ragusa. The budget was given by Universität Göttingen and Volkswagenstiftung. Publication in preparation. Bergemann 2018.
[23] di Stefano 2000, 204–210 Abb. 27. 30; di Stefano – Ventura 2012, 63–69 besonders 68 f. Abb. 4–6.
[24] Bergemann 2019.
[25] UTM 33N ED50 455200 / 4080102.
[26] UTM 33N ED50 456109 / 4079946.
[27] Uggeri 2015, 257 f. Abb. 227 f. 182 (D); Di Stefano – Ventura 2011, 207–214 especially 209 fig. 4. 5; Di Stefano 1984 – 85, 763 f. 782–792 Abb. 6–9 Taf. 163. 164. 169–172.

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Fig. 1: di Stefano 2001, 694 fig. 3. – Fig. 2–7: Camarina Survey project, Göttingen. – Fig. 2. 4. 6: Drone flight E-Science Center Tübingen. – Fig. 8: J. Bergemann.

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# The Chora of Camarina from Archaic to Roman Times: a Sustainable Cultural Landscape?

**Mario Rempe**

Interest in economic pressures on the environment is a rather new topic in archaeology. In the last four decades, several scholars and their studies focussed on landscape archaeology and ecological change.[1] While especially earlier studies have highlighted possible reasons for landscape change and ecological problems, approaches have also emphasized biases for research. Recent publications have also dealt with risk avoidance strategies and schemes of the ancient settlers to consolidate their cultural landscapes.[2]

The following case study from Camarina,[3] in Sicily, will add another view on landscape change and its implications for settlement patterns in antiquity, looking especially for problems in maintaining the landscape and efforts to guarantee sustainability.

Archaeological investigations in the chora of Camarina have evidenced a land division. Much like in Metaponto and the Black Sea area, the area surrounding the polis shows regular divisions of kleroi from the 5th and 4th centuries BC until Hellenistic times. Farms, streets, and other infrastructure were aligned to the city grid.[4]

The city itself experienced several periods of instability and change during antiquity. The third foundation of the city in 461 BC aimed at persistence, but external circumstances led again to disruptive phases. Camarina suffered destructions by the Mamertines in 275 BC and was conquered by the Romans in 258 BC during the First Punic War. These events have been interpreted as a deadly blow for Camarina, especially at the early stages of archaeological research in Camarina.[5] Investigations that are more recent have shown that there is no absolute break in the settlement patterns. Archaeological evidence for rural sites in the wider territory, mainly alongside the rivers, and continued use of structures on the acropolis do evidence a continuity of settlement.[6] The Göttingen surface survey has shown that the regular Greek grid of farmsteads fell out of use before the Roman expansion in southeastern Sicily. The sites of the Roman phases are dispersed in the hinterland. The latest archaeological evidence from the acropolis was dated between 50 BC and 50 AD.[7] The settlement of Caucana and its harbor became a more suitable nucleus of Roman activities in the area.[8]

## Landscape Reconstruction

The rivers Ippari and Oanis and their adjacent plains are the dominant features of the modern landscape. The area developed into a swamp later and was ameliorated in the 19th century to create arable farmland. Moreover, the promontory near the coast, which housed the ancient city (fig. 1), is an important point of reference. The annual precipitation of the area amounts today to between 501–550 mm,[9] and it is safe to

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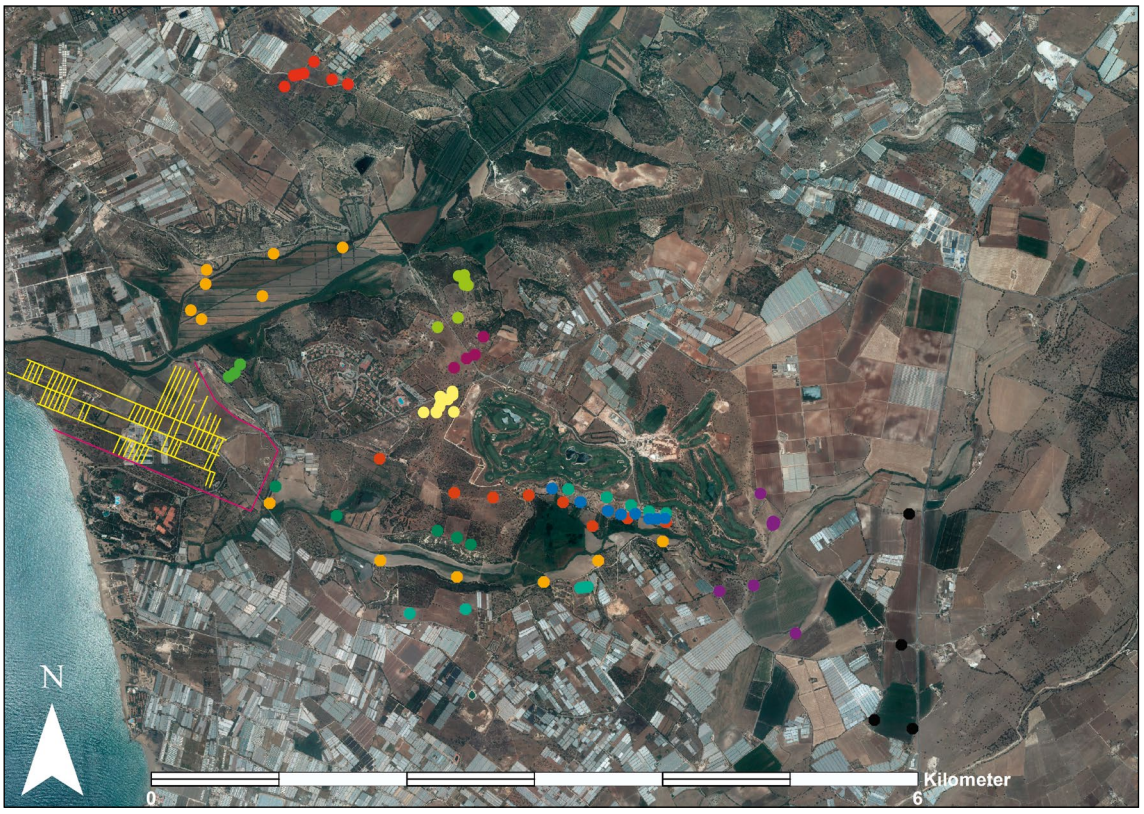


Fig. 1: Satellite Image of the area around ancient Camarina.

assume, that the ancient city of Camarina received its water from the hilly hinterland. Furthermore, numerous indications of rock-cut cisterns and channels near farms and settlement sites[10] hint to practices of water management.

Understanding sediments, soils, and vegetation changes is crucial to reconstruct the palaeo-landscape. Regarding the dissolution of the grid of farmsteads in the Camarina chora in Roman times, environmental degradation, like erosion processes or shortage of resources is a possible hypothesis, rendering an understanding of the landscape in antiquity even more desirable.

To get a first impression of sedimentation processes in the area we built a RUSLE model in ArcGIS. It gives good indications of sedimentation dynamics, without displaying absolute realities (fig. 2). High sedimentation and deposition rates can be expected only at the fluvial terraces. The slopes, which are moderately steep, seem to be prone to wind erosion as well as colluvial transport of sediments. Alluvial depositions in the area do only play a minor role nowadays. The Oanis and Ippari rivers are fairly slow currents with shallow riverbeds.

Higher potential for deposition is observable only where alluvial and colluvial sedimentation coincide. Several excavation reports remark that the ancient structures detected were reached quickly. The contexts were buried in depths between 50–100 cm,

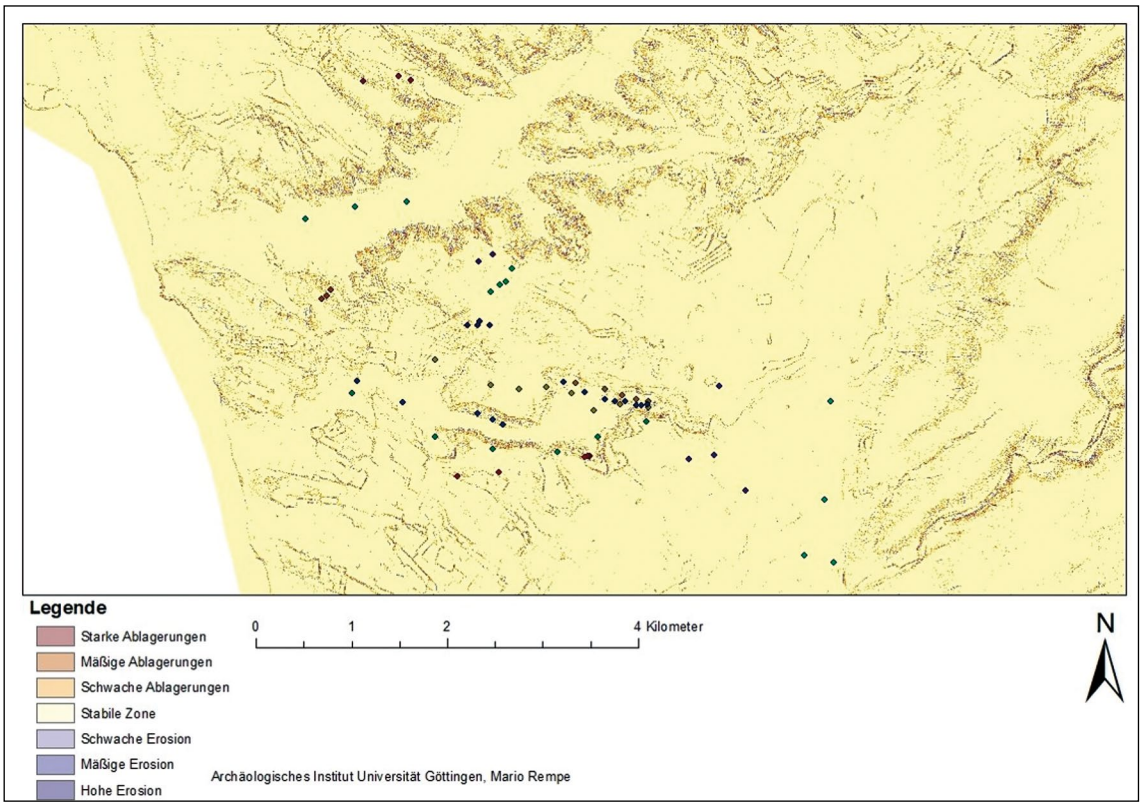


Fig. 2: RUSLE model for Camarina.

often even less.[11] Most of the farms and the infrastructure in the chora were not covered by thick layers of soil. We can thus agree with the following assessment of Orsi on both city hill and chora: "È falso che Camarina sia nascosta sotto enormi masse di sabbie; (…) Noi vedremo invece che il livello archeologico trovasi generalmente ad un metro di prof., se non anche a meno; il che vuol dire, che fra il piano antico della città ed il moderno della campagna vi època differenza".[12]

Several geological reports on the area are published.[13] Sandy, gravely layers and conglomerates of Pleistocene age are built upon six older strata of alternating marl and sandstone layers. Above the Pleistocene formations, there are alluvial sediments and other recent deposits, none of which are dated yet.[14]

Despite the information from geological reports, excavation reports, and the model, an augering campaign was conducted to understand recent soil formation processes better. Rows of coring points were created in the inner and outer chora (fig. 3), avoiding steeper slopes. As many archaeological sites were recorded around the fluvial terraces, these areas were included.

With the exception of some areas around the Ipparis and directly at the Oanis, the cores consisted of sandy, dry soils. The cores[15] did not show remarkable layers hinting to uneven distribution of sediments or conspicuous beddings. The well-sorted sediments


Fig. 3: Location of OSL dated cores taken in the chora of Camarina.

did not give any indication for massive and sudden erosion events. It seems more likely, that soils were generated by slow alluvial, colluvial or aeolian deposition, depending on the local microenvironments. There are only very few spots in the Camarina landscape, where higher sedimentation rates, originating from different sources, lead to thicker deposits of sediment, mainly in the floodplains in close vicinity to the river courses.

Three cores from three different levels of the river terraces near the survey site Donzelli (fig. 4) shall be discussed briefly. Their positions are corresponding but differ in height above sea level, as they are taken from the upper, middle and lower fluvial terraces.

At the upper terrace (fig. 4) not much soil has accumulated above the underlying rock. The layers are thin and do not differ greatly from one another. One the middle terrace, the layers are thicker, but remain similar to each other, consisting mainly of very dry, sandy sediments. At the lowest terrace, near the river course, the lower layers consist of loamy and silty layers.

In terms of soil taxonomy, we are dealing with entisols at the upper and middle terraces, of the subgroup torripsammets, following USDA classification.[16] Thus, we are discussing sandy soils with rather non-descriptive layers, which are built upon the typical fine yellow Pleistocene loess of the area. A fine chronological differentiation of the layers is not possible until now, as there have not been found any organic materials. OSL dating at some selected spots will procure a clearer chronological framework for the layers.[17]

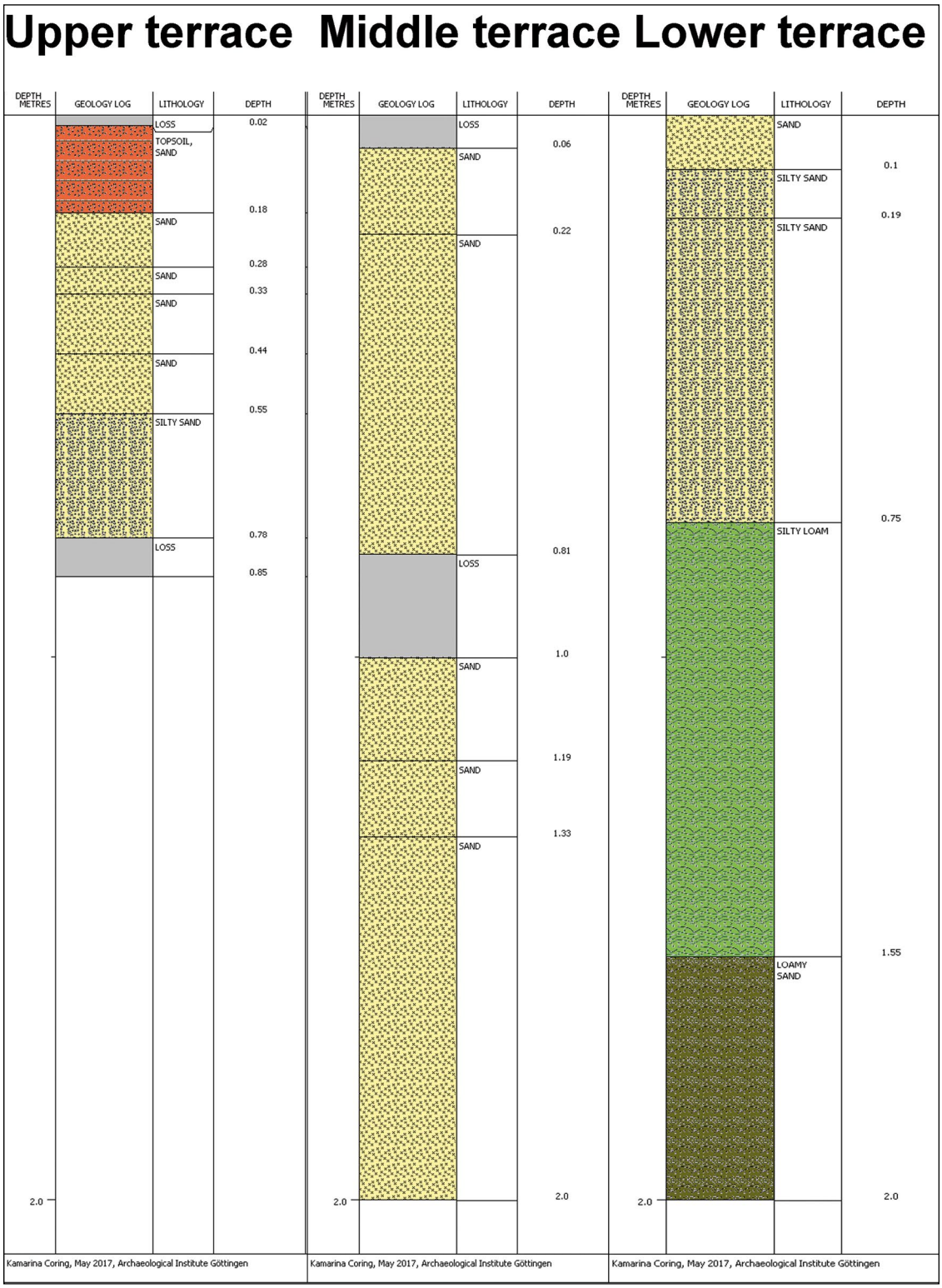


Fig. 4: Cores from three different rows at Donzelli, Oanis Valley.

Recalling sedimentation dynamics in the research area, deposition rates are rather marginal and in many cases, the auger hit solid rock well before 2 m depth. Looking at other regions in Sicily and their characteristics, like for example the Gornalunga, Troina and Simeto valleys,[18] it seems evident, that sediment dynamics differ to high degree locally and that low deposition rates are not a unique feature of the Camarina area. Sediments seem to have been distributed in regular spatial and temporal patterns over the three terraces at Donzelli, rendering it difficult to argue for massive, human-induced soil erosion. Human-induced deposition processes should create different sediment patterns than slow natural deposition processes.[19] Thus, the sediments do probably not evidence overexploitation, which led to erosion around the river terraces and in the river plains. Greek land use, given the archaeological record and results from geophysics most likely farming in small agricultural units, did apparently not overstrain the landscape.

## Environment and Land Use in Ancient Camarina

If landscape change apparently did not take place on a major scale at the terraces, then why is the key area of Greek farming untapped for a period of more than 300 years[20] from Hellenistic times onwards?

During the Greek phase, farmers seem to have cultivated preferably wheat varieties, not only for subsistence but mainly to export it. Sicily had great agricultural potential as well as fame as a wheat producer,[21] and archaeological and palynological evidence directly from Camarina does speak in favor of export. Several indicators for grain cultivation and export have been highlighted. In 1958 a tower of the city wall was excavated. Inside, a grain storage and other agricultural products were discovered, still containing the charred remains of different crops.[22] While hulled barley was dominant within a sample analyzed by Hans Helbaeck, club wheat has also been detected. The charred seeds were well developed, pointing thus to irrigated fields. Besides these cerealia, leguminous plants, as well as wild oat (avena), occur.[23]

In Contrada Maestro, near the mouth of the Irminio River, a lead tablet dealing with the purchase of an unknown amount of grain was found at a farm.[24] Standard grain measures from the times of Hieron are also pointing to intensive grain cultivation.[25] Furthermore, the farms, as well as the agora, evidenced high numbers of amphora and in Roman times, when the city as a civic center had already ceased to exist, a large depot of amphora was found in one of the stoai of the agora.[26] The depot of about 800 "anfore commerciali, quasi tutte greco-italiche"[27] does speak in favor of considerable trade, also in Roman times, while a granary on the agora hints to grain transactions.[28]

Within the scope of the Göttingen research in Camarina several pollen cores were taken, the most promising sequences in the area near Bellaccio[29] in the Oanis valley (fig. 5)

Fig. 5: View on the Oanis valley, in the background area of Bellaccio (hills).

The area in the floodplain and near the fluvial terraces offered a relatively high amount of wet sediments. One core has been dated linear[30], indicating a time horizon reaching back to around 2650 BC (fig. 6). Analysis on the preserved pollen generated a chance to compare the development of physical landscape, vegetation and settlement history, as the pollen core site is situated near several Greek sites on the fluvial terraces of the Oanis.

More than 50 taxa were counted during the palynological analysis.[31] The loss on ignition analysis shows a steady decline in carbonates in the sediments from 600 BC onwards, while the fire activity analysis hints to a settlement peak in the Classical era (fig. 7). The landscape in the Oanis valley became open from around the 8th century BC onwards, a significant increase in cerealia taxa is observable between 680–220 BC. A parasitic fungus in the pollen record, *tilletia caries* is a further indicator for grain cultivation,[32] much like other pollen indicators of human activity such as Plantago (fig. 8).

The loss on ignition analysis results and pollen of aquatic plants do speak in favor of segmentation of the river valley. Thus, wet areas and dry or drained zones are to be envisioned. These signals could derive from the river environment, but also from drained areas with irrigation systems. Looking at other areas in the Camarina chora, irrigation networks are attested by literary sources and archaeological finds. Pindar[33] tells us about the channels at the Ippari, which were set up around 461 BC.[34] Cisterns and rock-cut channels, providing water for agricultural purposes, are moreover important and reoccurring features of the farms around th rivers.[35] The pollen of aquatic plants and the sediments of the core (fig. 6), which indicate phases of a dry environment, are supporting the reconstruction of a similar system at the Oanis. Looking at the land use,

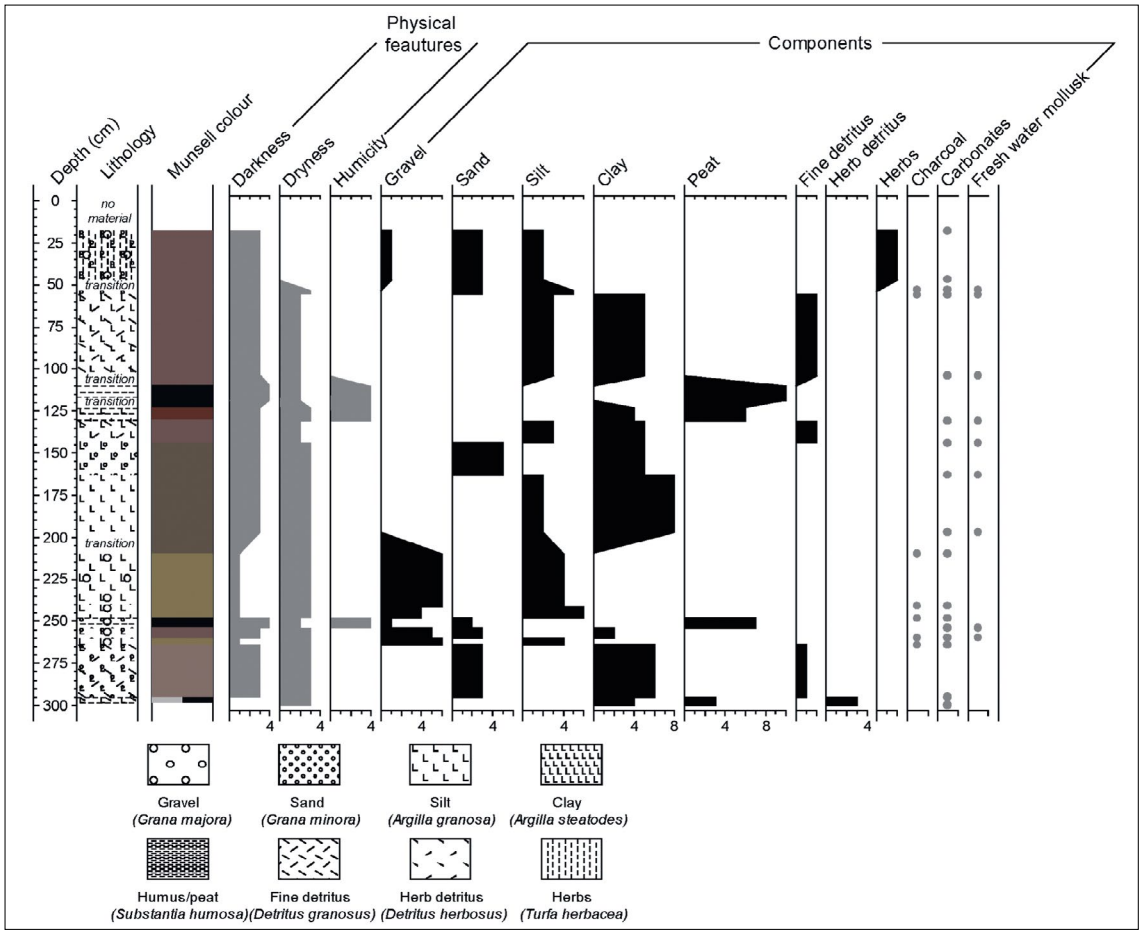


Fig. 6: Linear dating of the pollen core in the valley near Bellaccio.

the Oanis valley served as pasture area before the polis of Camarina was founded. The fire activity analysis indicates slash and burn in this period. After deforestation of the area, the pollen record makes the hypothesis of intensive cereal agriculture possible.[36] Agriculture in the area does seem to come to a definite end from the end of the late 4th century BC onwards. This is to a certain degree surprising as the overall vegetation and the landscape are not subject to deterioration, but remain stable. The change in land use is thus probably reducible to socio-economic changes and new limitations and views on the land use at the Oanis.

The sediments of the pollen cores should shed light on this change. Layers containing peaty and loamy sediments are as well observable as layers with sandy, rather dry sediment conditions. The development of the area into a swamp after the late 4th century BC seems highly plausible. Given the implementation of irrigation systems in the area in Classical times, one could deduce the later landscape change to the abandonment of the valley by human agents. The irrigation systems, which fell out of use before Roman times turned the area at the Oanis into a swamp.[37]

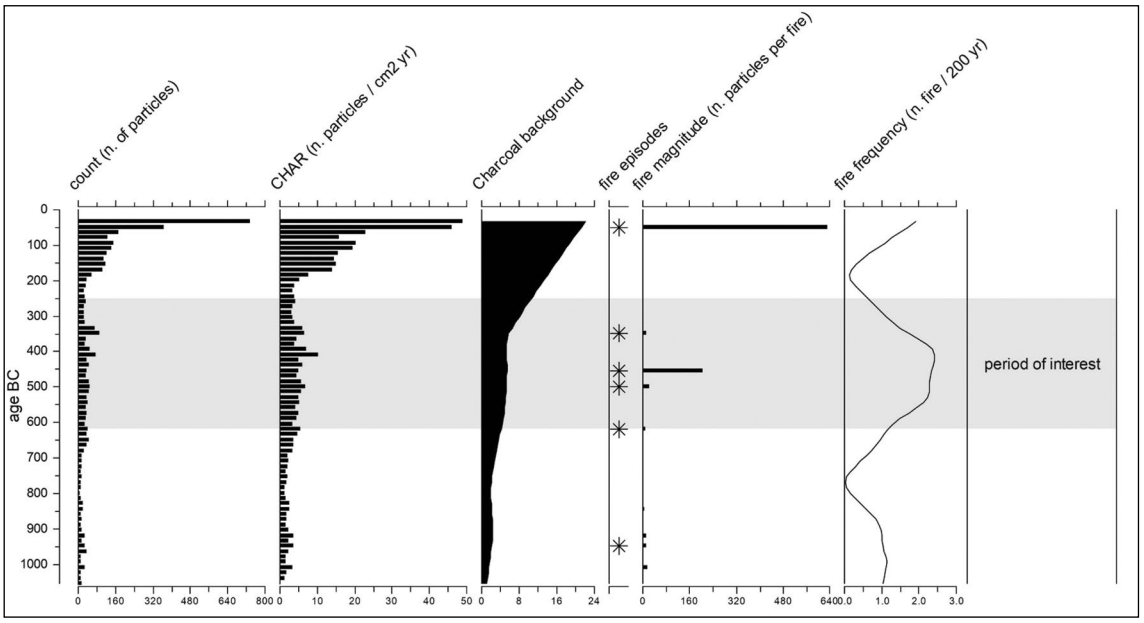


Fig. 7: Charcoal analysis of the pollen core.

**Economy and Nature at the Oanis River: a Sustainable Equilibrium?**

As far as there are no indications for overexploitation in the area around the lower Oanis valley, Greek farming seems to have been sustainable. Along the Oanis and its river terraces, a lot of small sites with a rural character can be envisioned. The ancient farmers relied on different methods to sustain their environments and had an awareness of thresholds and concepts of dealing with agricultural bottlenecks.[38] Efforts of sustainable exploitation of resources are crop rotation, diversification,[39] water management, storage, and fertilization.[40] Fallows, slash and burn cultivation, as well as countermeasures against erosion like terracing, are further indicators.[41] Moreover, it seems reasonable to assume, that the ancient farmers used well-suited places and explored ecological niches.[42] The areas in and between the floodplains, which were divided into agricultural units (kleroi) were probably producing cash crops. The Oanis area was well suited to produce different types of grain. Soils and water availability support intensive cultivation of wheat and other cereal types as stated by ancient agronomists and supported by modern suitability analyses.[43]

It seems plausible to argue that the foundation of 461 BC led to an efficient and sustainable exploitation of the chora, as indicated by the farm grid and irrigation networks. After the Carthaginian expansion, these systems fell out of use, at least in the area of the Oanis valley.

As the former agriculturally exploited zone at the Oanis became boggy because irrigation systems could not be maintained anymore, this could have happened in the wider territory of Camarina. Roman settlers could have preferred to move further

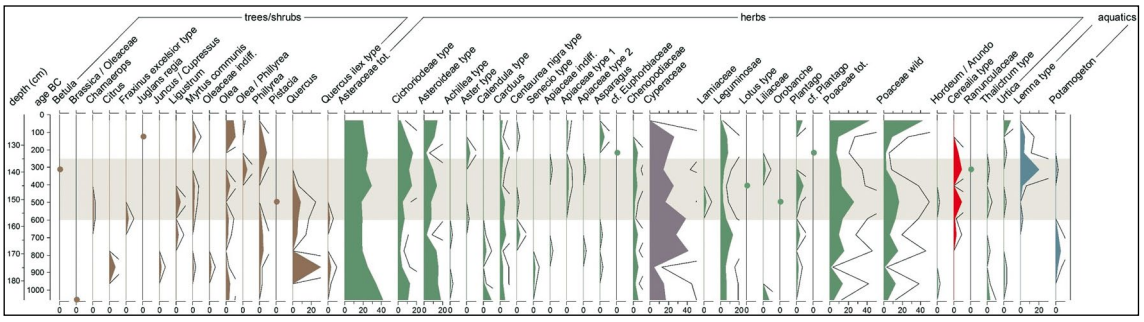

Fig. 8: Taxa represented in the pollen core.

inland. Looking at general trends of Roman Sicily,[44] dispersed Roman settlement and exploitation is a likely hypothesis, with Roman settlers acting for economic success on isolated estates.[45] It seems however reasonable to argue that differences between Greek and Roman exploitation and settlement preferences as well as landscape change induced by short-termed catastrophic events rather than human overexploitation led to the shift in settlement patterns in Roman times.

## Notes

[1] Butzer 1964; Dincauze 1987; Hughes 1994; Leveau et al. 1999; Horden – Purcell 2000; Grove – Rackham 2001; Attema et al. 2010; Sinclair et al. 2010; Dincauze 2013, to name only a few. For considerations on the state of the art, especially at German universities see Meier 2009 and Teichmann 2010.

[2] Forbes 1982; Gallant 1991; Redman 1999; Redman 2005; Marston 2011; Marston 2015.

[3] I would like to thank Prof. Dr. Johannes Bergemann for the possibility to publish preliminary results from the Camarina Survey as well as all collaborators who helped me conducting my studies there.

[4] Pelagatti 1981, 725–728; Bergemann 2012, 37.

[5] Schubring 1873, 503; Orsi 1899, 204; Pace 1927, 63–66.

[6] Di Stefano 1982, 332–335. 339; Uggeri 2015, 89 f.; Sulosky Weaver 2015, 62 f.

[7] Di Stefano 2006, 158 f.; Sulosky Weaver 2015, 62 f.; Di Stefano 2013, 60.

[8] Di Stefano 1982, 336–337; Di Stefano 1997, 463; Pace 1927, 130–135.

[9] Di Piazza et al. 2011, 396–408.

[10] Di Stefano 2001, 698 f.; Di Stefano 2002, 21–23; Pelagatti 1981,724 f.; Collin Bouffier 2006, 188–193; Cordano – Di Stefano 1997, 292–300.

[11] Besides the already cited examples one can find thickness of topsoil layers in several excavation reports: Orsi 1899, 201–278; Orsi 1904, 853 f. fig. 62. 63; Di Stefano 1984, 124; Pisani 2008, 21; Di Stefano 2000, 200; Di Stefano 1992, 120 fig. 4

[12] Orsi 1899, 207 note 1

[13] Ragusa 1902; Ragusa 1903; Rigo – Barbieri 1959; Di Grande – Grasso 1977; Pedley 1981; Amore – Randazzo 1997; Reuter et al. 2002.

[14] See Di Grande – Grasso 1977, 212–216.
[15] A more detailed discussion of our results from the augerings in the chora of Camarina will be found in my PhD thesis, which I would like to present in autumn 2019; all results presented here a preliminary.
[16] USDA Soil Survey Staff 1999, 436.
[17] The team took samples to do OSL dating during the final campaign in 2018, results pending. For method and application of OSL dating in mediterranean environments see e.g. Fuchs et al. 2004, 335–338.
[18] Cfr. Ayala – French 2005, 149–167; Chester – Duncan 1979, 293–315; Judson 1963, 287–289.
[19] van Andel et al. 1986, 110–113; Goldberg – MacPhail 2013, 194 f.; May 1991, 224 f.
[20] Di Stefano 2006, 158 f; Di Stefano 2013, 60; Sulosky Weaver 2015, 62 f.
[21] See for example Semples 1921, 59–63. 70–74; Dunabin 1948, 211–216; Casson 1954, 168; Nenci, 1993, 3; Fantasia 1993, 25–31; de Angelis 2000, 109; Pazdera 2006, 165; de Angelis 2016, 267–296; for a critical discussion on Sicily as wheat producer see de Angelis 2006, 29–47.
[22] Di Vita 1958, 84–86; Di Vita 1983, 32–36.
[23] Di Vita 1983, 32–34.
[24] Cordano 1997, 349–354.
[25] Walthall 2011, 159–164.
[26] Pelagatti 1985, 687–692; Di Stefano, 1994, 1369; Di Stefano 2000, 196; Uggeri 2015,140. Excavations at the farms and the Göttingen survey evidenced high numbers of amphora as well.
[27] Uggeri 2015,140.
[28] Uggeri 2015,140.
[29] The author and collaborators from the department of Palynology and Climate Dynamics in Göttingen took the cores together. One core has been analysed already, its geographical position is x=45.4239 y= 40.7968. The palynologists signed responsible for the analysis and made the core and its implications comprehensible. I would like to express my sincere thanks to Herman Behling, Siria Biagioni and Alena Vieregge. For helpful discussions I would like to thank the aforesaid researchers as well Hans Jörg Küster, Wiebke Kirleis and Willy Tinner.
[30] It is a common practice to hand in only two samples when testing pollen cores for their chronology. There are currently more samples being analysed, as the general timeframe provided by linear dating seems to fit well.
[31] The analysis was carried out by Alena Vieregge and Siria Biagioni from the Department of Palynology and Climate Dynamics at the University of Göttingen.
[32] Tilletia caries and its effects are described in ancient sources, Theophr. hist. plant. 8, 10; Plin. nat. 18, 44.
[33] Pind. O. 5, 4. 9–14.
[34] For a discussion of the archaeological remains and Pindars song on Camarina see Schubring 1873 498; Pace 1927, 9–12; Brunel 1971, 327–342; Cordano – di Stefano 1997, 291; Di Stefano 1998, 266; Collin Bouffier 2006, 186; Uggeri 2015, 67–75.
[35] Di Stefano 2001, 698 f.; Di Stefano 2002, 21–23; Pelagatti 1981,724 f.; Collin Bouffier 2006, 188–193; Cordano – di Stefano 1997, 292–300.
[36] It remains still open to debate which cereal types are visible in the core.
[37] For a similar development in the Pontine region see Attema 2017, 466–468.

[38] See Marston 2015, 586–588; for risk avoidance strategies and it's archaeological implications see Marston 2011, 195–197 and Forbes 1982 passim.
[39] Butzer 2005, 1775 f.; Hughes 1994, 132–134.
[40] Berger – Jung 1999,161 f.; Butzer 2005, 1775 f.; Thommen 2012, 57 f.; Winiwarter 1999, 205–201; Hughes 1994, 138 f.; Grove – Rackham 2001, 226 f.; Forbes 1982, 422 f.
[41] Berger – Jung 1999, 162; Winiwarter 1999, 205–210; Hughes 1994, 138–141; Isager – Skydsgaard 1995, 22–24. 80–82; Fussel 1967, 31 f.; Grove – Rackham 2001, 107–113. 115–117.
[42] Fussel 1967, 21; Forbes 1982, 325–328. 334.
[43] For example Cato, de agricultura 34, 49; for a discussion of agronomers and land use requirements as hypothesized for ancient South Italy see van Joolen 2003, passim and especially 122-127; Spurr argues for intensive cultivation of barley in South Italy and Sicily. Wheat as cash crop would in Sicily certainly calls for irrigation, see Spurr 1986, 14 f. 20–22.
[44] Belvedere 1996, 81–89; Wilson 1990, 33–45. 221–232; Bergemann 2010, 161–170; Manganaro 1988, 22–54; Wilson 1988, 189–204.
[45] See for example Bintliff 2013, 285–290 and Rizakis 2013, 23–27.

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# Integrating Botanical and Faunal Assemblages with Material Culture to Reconstruct Paleoenvironment and Diet in *Akrai/Acrae* (South–Eastern Sicily)

**Roksana Chowaniec**

The ancient town *Akrai/Acrae*[1] is located to the northwest of the modern town of Palazzolo Acreide, on flat topped defensible hill, named Acremonte, surrounded by fertile lands, forests, and two rivers the Anapo (*Anapus*) and the Tellaro (*Helorus*). The Acremonte hill is a part of large plateaus of the Hyblaean Mountains (reaching approx 600–800 m asl) with the landscape consisting of alluvial terraces and steep slopes traversed by deep-seated valleys, with surrounding lower–lying areas. It is also a volcanic area, consisting of carbonate and volcanic rocks with its most famous volcano, Monte Lauro (fig. 1).[2] It is highly probable that before settlements appeared in the area, the majority of it was covered by Mediterranean woodlands, and there was an abundant wild game with lush, dense vegetation.[3]

*Akrai*/*Acrae*, as one of the sub-colonies was founded by Syracuse in 664/663 BC.[4] and located at about 35 km in a straight line from the coast, main ports, markets and mother-colony at the same time.[5] Its foundation was linked to both, political and economic factors. Moreover, the Acremonte offered a vast and great view of the surrounding area, permitting early detection of any potential danger as well as control of the agriculture and grazing areas.[6] For centuries, *Akrai* was a place on Syracuse's boundary. Until the 3rd century BC, the town had little significance and was completely overshadowed by Syracuse.[7] Intensive progress probably began in the mid–3rd century BC, at the time of Hieron II, ruler of Syracusan Kingdom.[8] After the fall of Syracuse in 212/211 BC, *Akrai*, like other towns beforehand depended on Syracuse, was under the administration of Roman province.[9] The town was subordinate to the Roman authorities (*civitas decumana*) but was continuously populated and functioned well enough in the new political structures, as suggested by the fact that it was able to cover the costs of *decuma* to Rome.[10]

The new stage of archaeological excavations (2011–2017)[11] yielded archaeological material dated from the end of 3rd century BC up to the beginning of 8th century AD, which provides a vivid picture of the settlers' life.[12] Residential complexes were built in the late Hellenistic–early Imperial period, later used in Imperial period, destroyed by a natural disaster in the 50s–70s of the 4th century AD intentionally levelled in the late 4th century AD, and reused as a place for various activities until the 8th century AD (fig. 2).[13] Also, the field survey and non-invasive investigations brought information about the vicinity of the town.[14] The material depicted here come from three main stratigraphic contexts. Only the material collected from the original occupation and the reoccupied contexts were applied in the current studies since the artifacts from the aforementioned levelling layers are blended and cannot provide reliable information about the paleoenvironment and diet.

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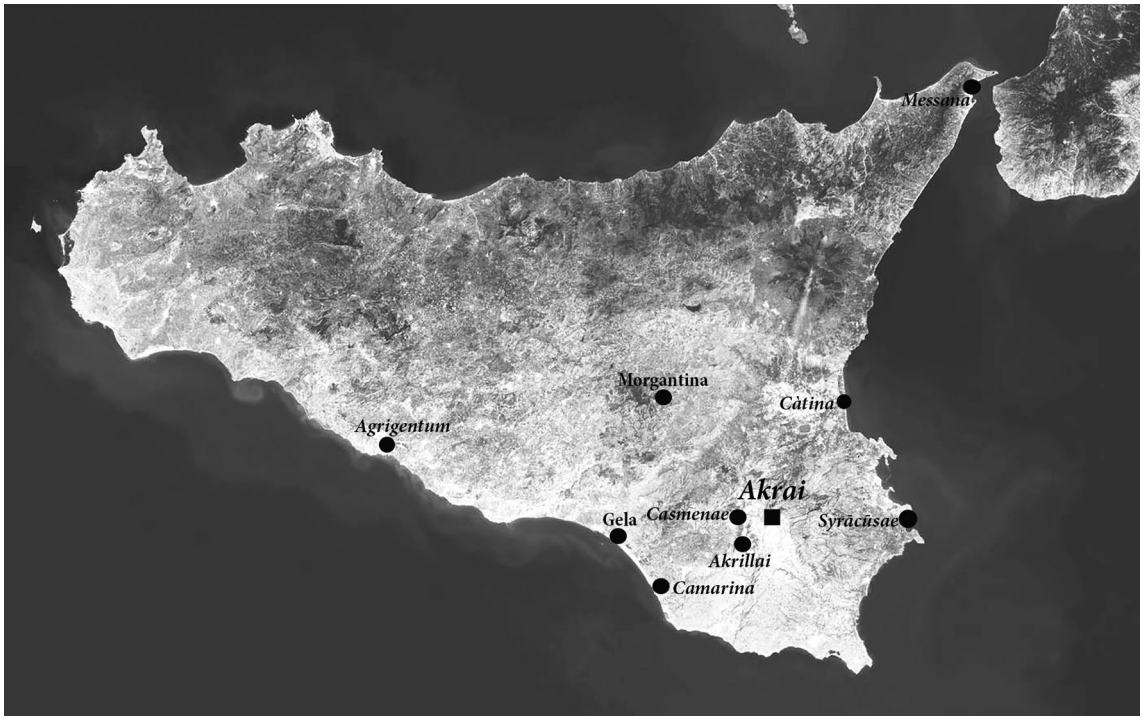



Fig. 1: Map of Sicily showing location of *Akrai/Acrae*.

Among the osteological material post–consumption remains dominated.[15] Evidence of animals' use for the domestic and agriculture functions was also present. All together over 28 thousands of bones and its fragments were recorded from both excavated deposits and sieved samples. But only ca. 23 thousands of bones selected from closed contexts have been taken into account in the study.[16] An estimated 37.1% of the bones were attributed to the late Hellenistic–early Imperial layers, 33.46% to the Roman period, and 29.0% to the late Roman-Byzantine periods. The osteological set represents 88.55% of the mammal remains, among them only a small percent (4.31%) belonging to wild species. In the late Hellenistic–early Imperial set, the most numerous of the four breeding species were pigs (48.0%), sheep and goat (30.0%), and cattle (23.0%). In the archaeological strata dated to the Imperial period, the above percentages of animal remain changed. The percentage of pig bones and teeth was estimated at 35.0%, for cattle at 34.0%, and for sheep and goats, it remained almost the same at 32.0%. In the culture deposits dated from the end of 4$^{th}$ century AD to the 7$^{th}$ century AD, the percentage of cattle was 38.0%, for sheep and goats it was higher than before (37.0%), as well as for the for pigs (24.0%) (fig. 3). The highest amount of wild animals, estimated at 10.0%, was registered in the late Hellenistic–early Imperial strata. In later dated levels the amount of wild animal was lower, and at the 4$^{th}$ century AD only amounted to 0.5%. Wild animals were represented mostly by red deer, fallow deer, wild boar and leporids. More than 450 bones were identified as bird bones, and ca. 81% were recognized to be domestic chicken. Other

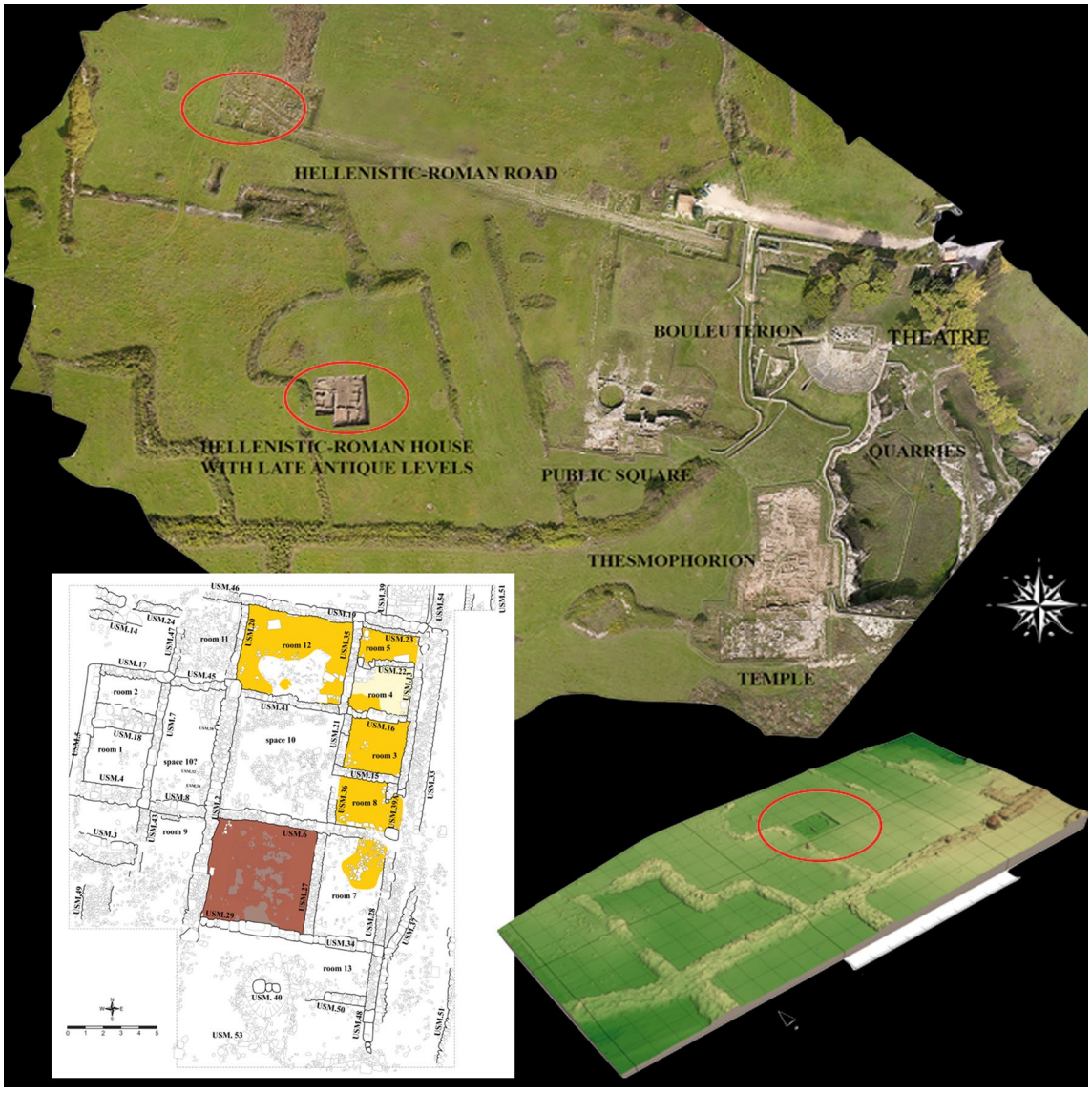



Fig. 2: Orthophotomap of archaeological site with excavated structures; General plan of excavated area; Photogrammetry of archaeological site with area of excavations.

species were represented by wild animals or possibly domesticated, i.e. rock partridge, pigeon/dove, song thrush, goose, quail, etc. (fig. 4) ca. 200 fish–bones were found which represents only 0.4%. A small number of remains belong to bivalve, particularly oysters, while 54 to the turtles and 202 to the land snail (mostly *Helix genus*).

Analyses of plant macro-remains also provide information about the use of plants by *Akrai*'s inhabitants. Specific sampling and flotation were done over the last excavation seasons (2014–2017).[17] A rich set of archaeobotanical remains, among them the olive stones, walnut shells, plum stones, cereals, and flax seeds were found.[18]

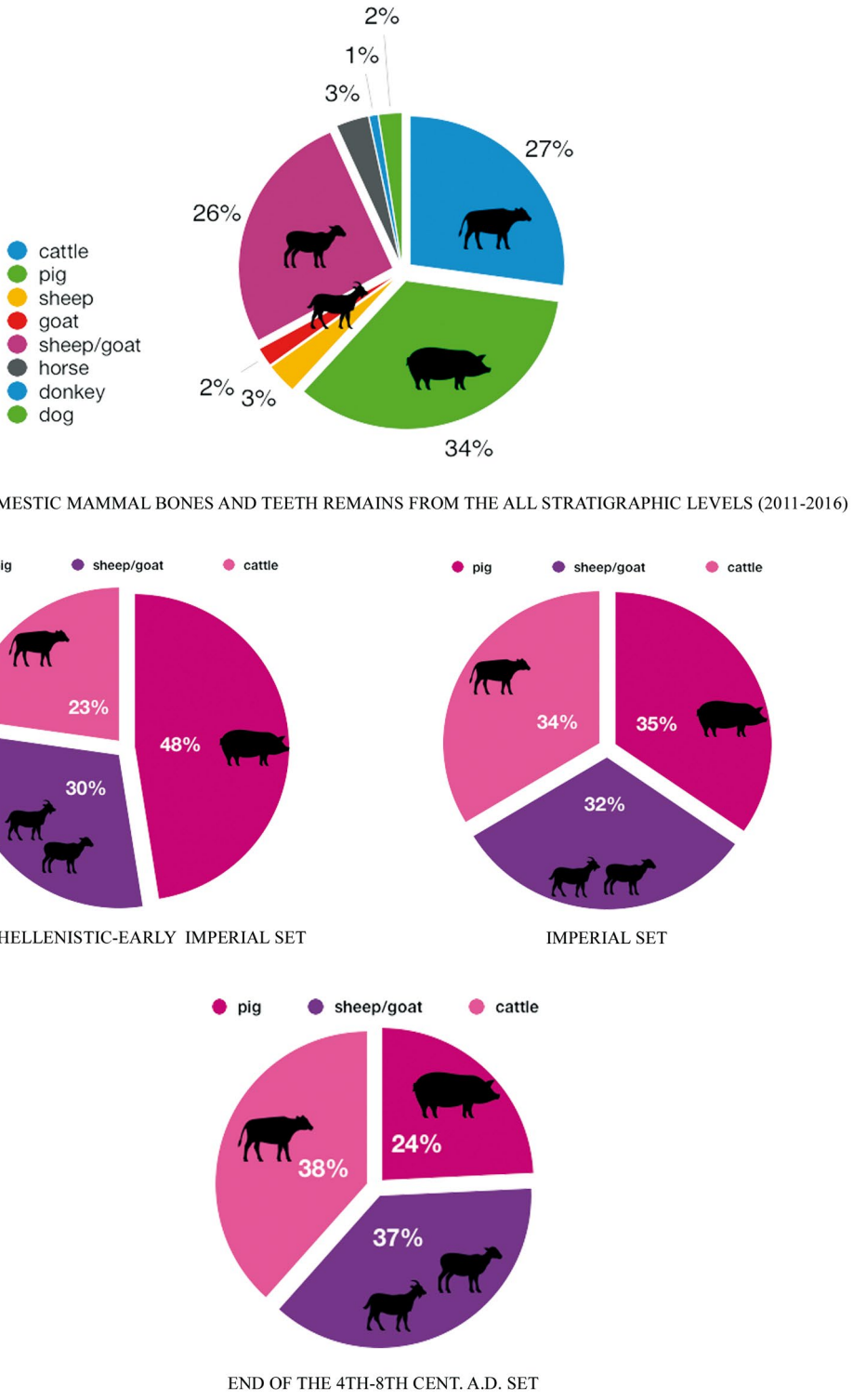
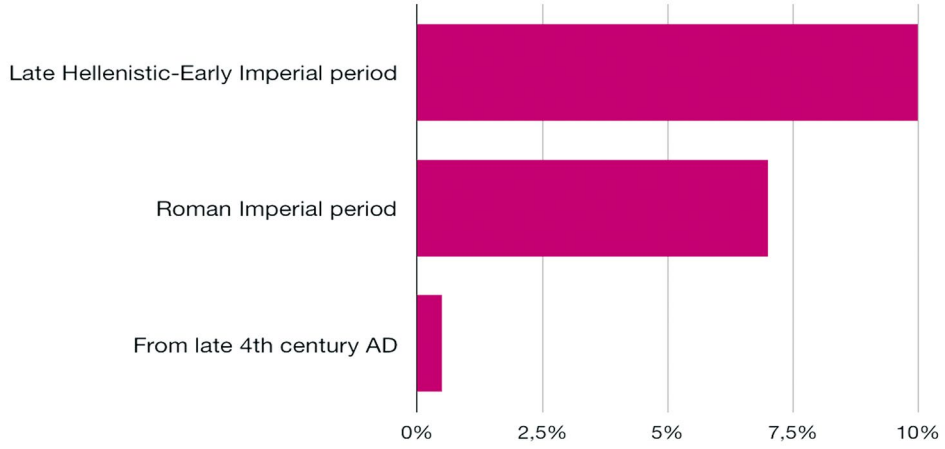
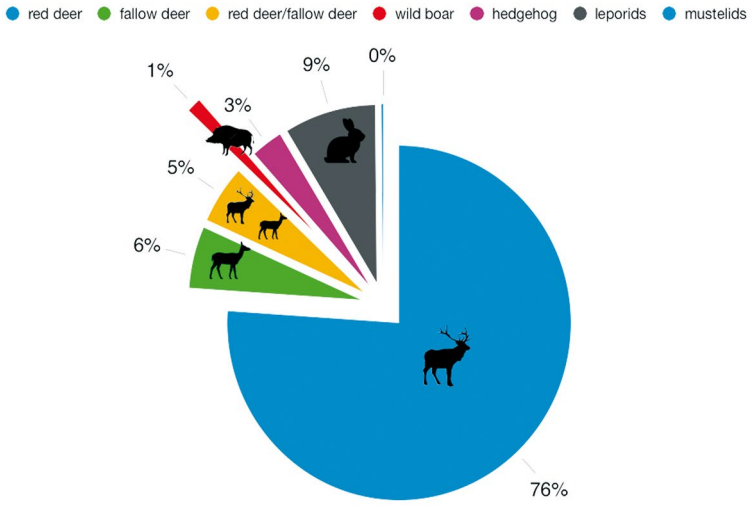



Fig. 3: Domestic mammal bones and teeth remains from all stratigraphic levels in charts.




PERCENTAGE OF WILD MAMMAL BONES AND TEETH REMAINS FROM THE ALL STRATIGRAPHIC LEVELS (2011-2016)




VARIETY OF WILD MAMMAL BONES AND TEETH REMAINS FROM THE ALL STRATIGRAPHIC LEVELS (2011-2016)

Fig. 4: Percentage of wild mammal bones from all stratigraphic levels; Variety of wild mammals bones and teeth remains from all stratigraphic levels.

First lipid analysis of plain and cooking pottery using gas chromatography with mass spectrometry was also conducted.[19] Lipids absorbed into the pores of pots were tested. In the results of the selected fragments degraded animal fat was observed, vegetable oils from plants and seed or fruits, pine raisin, wax and a mixture of animal fat (probably milk). Beside that the production and consumption of olive oil are attested by rock-cut press–beds with a small collecting cup–marks discovered in *Akrai*.[20]

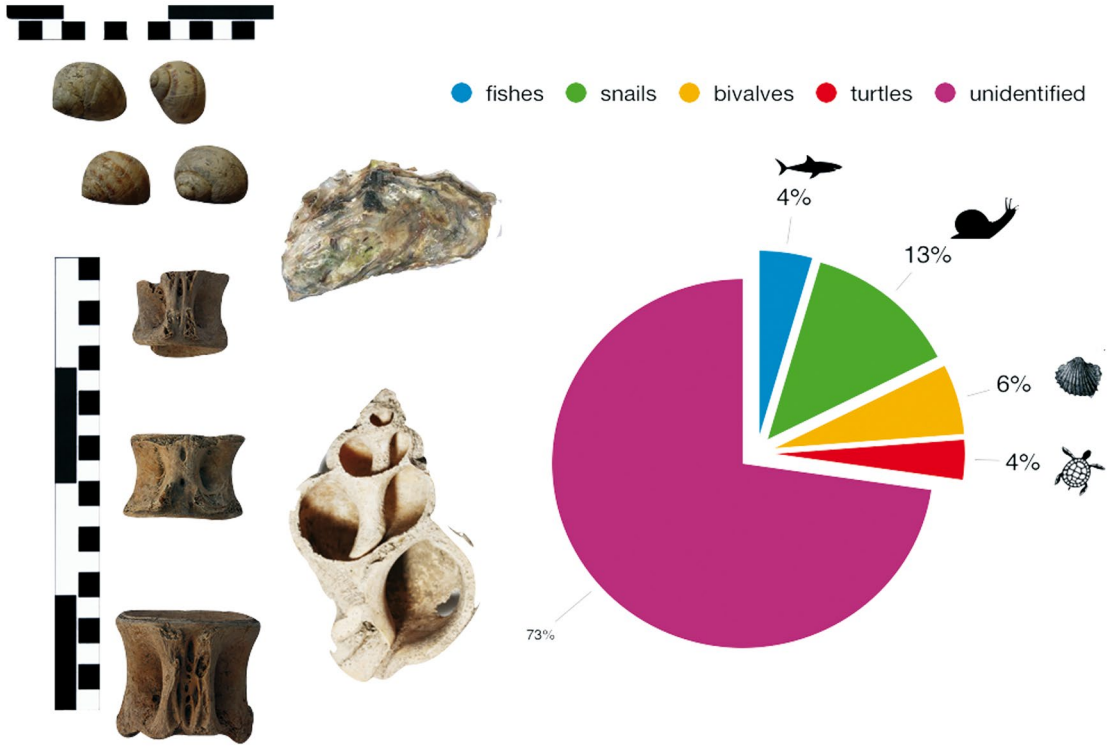
Another, very important approach for the reconstruction of both environment and diet at *Akrai*, are stable isotope analysis.[21] Dietary reconstruction using stable carbon

and nitrogen isotope analysis of collagen is based on the fact that different foods differ in their stable carbon and nitrogen isotope ratio. Stable nitrogen isotope analysis of bone collagen reflects trophic level or the position of an individual in the food chain. The climate also affects values of terrestrial mammals through its effect on plant and soil/rocks.[22] Twenty samples of wild species (red deer, fallow deer and leporids), and eight samples of dog' bones and three of cat' bones were thus tested.

One should call to mind archaeological material as well. The thermal treatment and cooking of food prior to its consumption was a significant part of Greco–Roman civilization and was widely known in *Akrai*.[23] The kitchen vessels demonstrate the evidence of thermal treatment of food, but also illustrate the methods of cooking or baking. The ceramic assemblage from *Akrai* allows us to construct a typology of the kitchenware. 65 types of cooking– vessels have been distinguished, including cooking pots, casseroles, pans, lids and bowls.[24] There is also a category of pottery called 'plain ware' for serving, preparing and consuming food, such as mortaria and bowls.[25] Evidence reflecting the food circulation can also be found among other artefacts, mainly the kitchen accessories, e.g. the remains of iron grates, fire hooks, spoons, and large knives for different types of meat.

The reconstruction of paleoenvironment and diet is not a simple and a smooth mission because generalizations might flatten a broad and complex matter. Therefore a fusion of numerous scientific sources and methods is needed.[26]

The results of the described material indicate that animals were the most significant source of meat.[27] Various preferences can be traced depending on the chronological phase. In the late Hellenistic–early Imperial period, the most popular source of meat was pig. Later, in the middle Imperial period, beef, as well as lamb and goat, were consumed more often than pork. In the late Roman-Byzantine periods, the meat of small ruminants was slightly willingly present in the daily diet.[28] Practically the whole carcass of the mentioned animals was used, including the head, which is indicated by numerous butchery marks on the skulls and jaws. Traces of butchery, portioning, cooking, skinning, and cutting are visible on each part of bones, as well as marks of bearing, chopping, cutting, and filleting.[29] Bones display marks of charring and burning associated with the thermal processing. It seems that a very economical procedure existed with people using all parts of the animals, including those, which are less popular today.[30] The mentioned traces were observed on bones of domestic species, but rather infrequently on wild species. In many cases, bones had marks being the result of professional butchering and 'Roman technique' of butchering with a Roman cleaver.[31] This portioning of meat was known in *Akrai* but was used rather occasionally.[32] Wild species were also represented by cervids, leporids, wild boar, fox and hedgehog. The set of hunted mammals is rather small, characterized mainly by cervids and leporids. Among cervids were two species: red deer, whose bones represented the majority in each late Hellenistic–early Imperial sets, and fallow deer. Among the leporids, the presence of hare, probably the mountain hare or rabbit was noticed. The remains of hunted animals occur more often in the




FISH AND OTHER SEAFOOD REMAINS FROM THE ALL STRATIGRAPHIC LEVELS (2011-2016)

Fig. 5: Fish and other seafood remains from all stratigraphic levels.

late Hellenistic–early Imperial period, and later the number of these bones definitely decreased.

The diet was enriched with bird meat, both domesticated and wild. Domesticated chicken was very popular. The wild species were represented by rock partridge and song thrush. In many examples, it is very difficult to prove if the bird was eaten because of lack of consumption signs. These could be treated also as domestic pet. In cases of goose and pigeon/dove, unfortunately, it cannot be decided if the bones belonged to the domesticated or wild variety. However, a small number of bones, in comparison to domestic chickens, indicates their affiliation with wild birds rather than with domesticated animals.[33]

On menu appeared fish, most of them belonging to the *Tunidae* family, and other seafood, found mainly in the late Hellenistic–early Imperial strata (fig. 5). All seafood found in *Akrai* was imported from Syracuse. Therefore, the small number of fish bones and shells can be explained by the 35 km distance and the difficulties arising from the preservation of fresh goods. However, the presence of marine food in the diet of dogs and cats detected thanks to the stable isotope analysis is suggestive as well. Dogs and cats are considered to have had almost the same diet as humans due to their close relationships

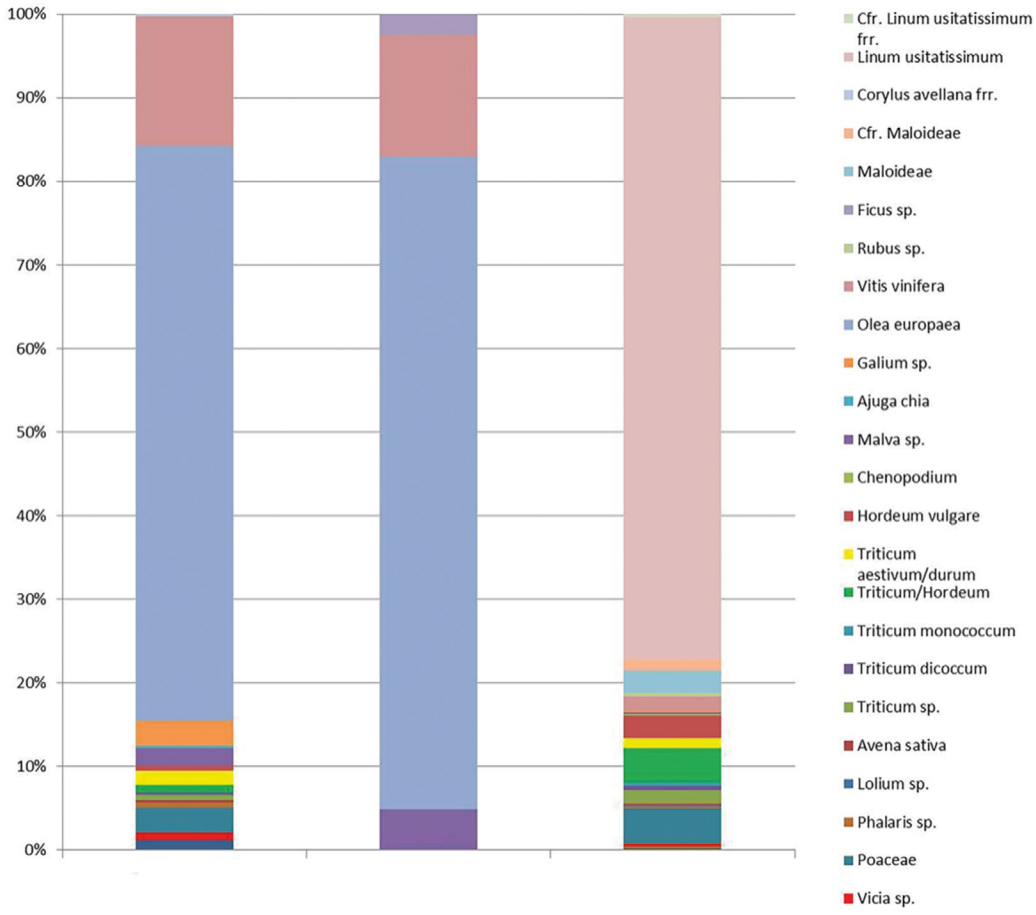



Fig. 6: Archaeobotanical data from the archaeological context.

with them from very early times. In the samples, a very positive carbon isotopic signal was registered which could indicate that the dogs and cats had a significant input of marine or freshwater food sources. Hence, if canines in ancient Sicily consumed some fish, those fish were either of a lower marine trophic level or of freshwater origin. On the other hand, it does not exclude marine/freshwater consumption for the stated animals.[34]

While the quantity of fish bones and bivalve shells, especially oysters, is low, a relatively conspicuous set of land snail was found. It is very well known that they were valued in Roman cuisine, so we cannot exclude that snails were eaten after the culinary preparations, as a substitute for seafood. Land snails, in particular, were everywhere and cheap, which already was mentioned by Epicharmus or Apicius.[35]

Some information regarding diet was also provided by age analysis. The age of cattle was ranging from 6 months to 7 years, of sheep and goats between 8–12 month old and then 3–3.5 years old and the pigs were killed before they reached morphological maturity (at about 3.5 years). The long lifespans of these three species brought numerous benefits, as they were main providers of milk and wool.[36]

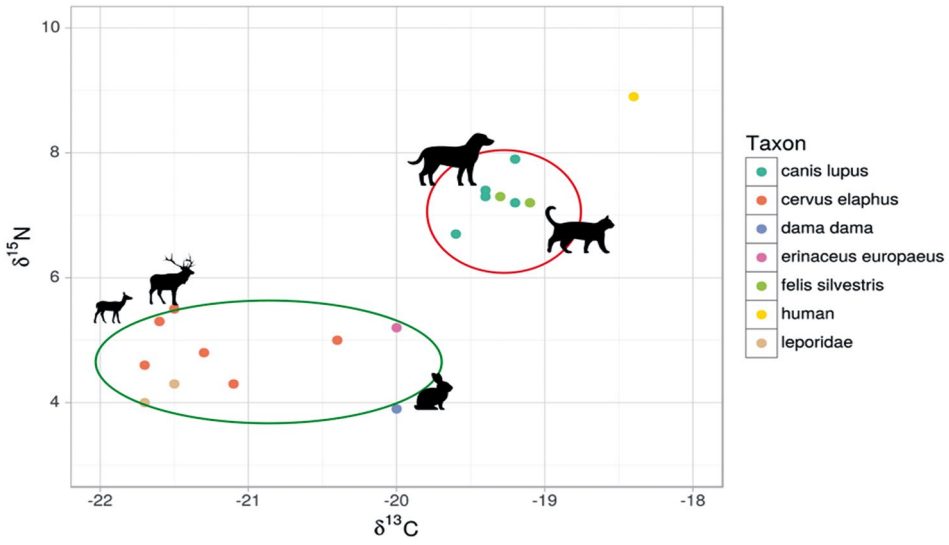



Fig. 7: Results of isotopic analyses.

The archaeobotanical remains indicated a large variety of plants. However, in the late Hellenistic/early Imperial and Imperial periods, leguminous plants, olives and grapes dominated. While in the last set dated to the end of the 4th–8th century AD the flax occupied an extremely important position (fig. 6). In the Roman Imperial period, we can observe also increase in the number of weed plants, among other galium, malva, etc. that may indicate weeds and leaving fields. In the first two periods, we also observe a huge number of fruit trees (86% and 83%). This percentage decreases drastically in the layers dated to the end of the 4th–8th century AD. Then the number of weeds and various types of grain increased. It is necessary to note that in late Roman/Byzantine strata a large amount of flax seeds was noted.[37]

The isotopic analyses also provided a number of interesting information about both the local environment and, indirectly, about the human diet. Herbivorous, such as red deer, fallow deer and leporids were predominantly grazers, with a plant-based diet, and deer mostly consumed plants of temperate regions. If deer's carbon value is high, it probably indicates the supplementary consumption of millet or grasses. However, the samples from different stratigraphic areas from late Hellenistic to late Roman periods show that consumption was linked to the consumption of plants growing in various types of plant communities of open habitat, grasslands and open woodland (fig. 7).

The diet was not characterized by trends but depended on the wider context of the surrounding region; size and location of the settlement; cultural and trade connections, natural habitat, among others access to raw materials, soil, hydrological system, plants and animals.[38] Regarding Sicily, the island was usually noted as fertile land, particularly known for grain production (e.g., Strabo, Diodorus Siculus, Cicero) and breeding (e.g. Theocritus, Diodorus Siculus, Ovid). The mountainous landscape offered good grazing conditions, while rich soil provided good farming. For both the Greeks and the

Romans – landscape and its natural benefits played a very important role. However, Romans used natural resources more extensively. Improved agriculture changed the quality of domesticated plants and resulted in the introduction of new plants: Emmer wheat, followed by sesame, lucerne, oats, fruit trees, and flax.[39]

The inhabitants of *Akrai* exploited the habitat by hunting, fishing, cutting timber, using groundwater, or farming. In late Hellenistic–early Imperial periods people consumed the meat of wild animals using natural source systematically, which also confirms that during this time Sicily had forests that are more extensive. However, reduction of the forest affected also their consumption and the human diet in late Roman/Byzantine periods.[40] Besides that, the presence of cervid bones as well as archaeobotanical remains, indicate that within the vicinity of *Akrai*, broadleaf and mixed forests of young trees and meadows, as well as mature trees (e.g. oak and beech), were grown. Leporids and wild boars were mostly present at forest edges or woodlands but were also housed in semi-wild *vivaria*. The fox was largely widespread and lived in both open areas and woodlands. Among the birds, thrushes were common in gardens, parks, farmland, and open woods. Wild pigeons/doves, however, were present in the mountain cliffs and caves. Rock partridges lived on mountain slopes and in areas of limestone rock, and in low grassland with sparse trees and bushes, or sometimes looked for refuge in the branches of low trees.[41]

The collected data from an extended time range presents changes in animal and plant economy as well as in food accessibility. The elaborated material shows that since the Roman conquest of this area in 212 BC up to the last decades of 1st century BC and the beginning of 1st century AD the inhabitants of *Akrai* retained a rather 'Greek' identity in daily life. The repertoire of faunal and floral remains and culinary preferences began to change not before two centuries after the Roman conquest. Detectable changes are visible in late Roman/Byzantine contexts, dated to the end of the 4th–8th century AD This should be related to the fact that since the end of the 4th century AD the population of the town was changed and new Christian inhabitants appeared in the town.[42] Besides that also intensive activity both in agriculture and crafts played a role in deforestation of the area, and thus in changing the set of accessible animals and plants.

## Notes

[1] Manni 1981, 133.

[2] Rigo – Barbieri 1959; Bousquet – Lanzafame 2004, 165; Monaco 2007, 39 f.; Lentini – Carbone 2014, 37. 39; Romagnoli et al. 2015.

[3] De Angelis 2010; Harris 2013, 177. 180; Hughes 2014.

[4] Thuc. 6, 5, 2; Di Vita 1987, 77–87; Fischer–Hansen 1996, 335 f.

[5] Recently with all previous literature cf. Chowaniec 2015b; Chowaniec 2017.

[6] Chowaniec – Misiewicz 2008.

[7] Cf. Bernabò Brea 1956; Gabba, Vallet (eds.) 1980, 499; Copani 2009, 16 f.

[8] Chowaniec 2017, 68–77. The range of merits ascribed to Hiero II was wide and included, for instance, so called lex Hieronica, innovations in Sicilian architecture, fortifications, waterworks, agriculture, along with new method for tiling roofs or high–end jewellery, cf. Chamoux 2002, 96; Dummett 2010; Wilson 2013b, 80–90.

[9] Chowaniec 2017, 126–130.

[10] Besides the available data from written sources (maps, registers, or inscriptions), the huge amount of archaeological artefacts also approve the functioning of Akrai/Acrae during the Republican and Imperial periods, and then in Late Antiquity and Byzantine periods.

[11] The presented research are carried within the project 'On the Borders of Syracuse. Multidisciplinary Studies on the Ancient Town of Akrai/Acrae, south–eastern Sicily, Italy' financed by the Polish National Science Center (no. UMO–2016/21/B/HS3/00026). Since 2017, the excavations of Akrai are sponsored in part by the American Numismatic Society. Special acknowledgments go to Dr. Maria Musumeci and Dr. Rosa Lanteri, for their great support of research at Akrai, first on behalf of the Soprintendenza dei Beni Culturali e Ambientali di Siracusa and later the Polo Regionale di Siracusa per i siti ei musei archeologici di Siracusa.

[12] Chowaniec 2015a (about the history of research); Chowaniec 2015b.

[13] Chowaniec 2015b; Chowaniec 2017, 130–177.

[14] Chowaniec et al. 2018a.

[15] Detailed elaboration of animal bones and teeth with all statistics were published by Gręzak 2015; Gręzak 2018. Bird bones were identified by Teresa Tomek from the Institute of Systematics and Evolution of Animals of the Polish Academy of Sciences in Cracow.

[16] Besides that some species were not included in the data related to consumption. Among them horse, donkey, dog or cat. The animal species played a different function in local economy, e.g. transport, as pets or for domestic use (eg. to protect grain from rodents or for hunting or guarding herds).

[17] Stella 2018. The research is realized in cooperation with Prof. Girolamo Fiorentino and Matilde Stella from Dipartimento di Beni Culturali, Università del Salento, Italy.

[18] Chowaniec – Gręzak 2016.

[19] The analysis were done by Prof. Florinda Notarstefano from Dipartimento di Beni Culturali, Università del Salento, Italy.

[20] Chowaniec et al. 2018b, 159.

[21] The analysis were completed by Dr. Elissavet Dotsika from Institute of Nanoscience and Nanomaterial Science, Stable Isotope Unit, National Centre for Scientific Research 'Demokritos', Athens, Greece and Dr Rafał Fetner from Institute of Archaeology, University of Warsaw.

[22] Fernandes – Jaouen 2017; Chantzi et al. 2016.

[23] Several bones exhibit of charring and burning which may be associated with the thermal processing of meat and bones.

[24] Wicenciak 2015.

[25] Młynarczyk 2015; Młynarczyk 2018.

[26] Fernandes – Chowaniec 2018.

[27] Chowaniec et al. 2018b.

[28] Chowaniec – Gręzak 2016; Chowaniec et al. 2018, 156.
[29] Gręzak 2015; Gręzak 2018.
[30] Chowaniec et al. 2018.
[31] Seetah 2002; Gręzak 2015; Gręzak 2018.
[32] Gręzak 2015, 351; Chowaniec et al. 2018, 156.
[33] Gręzak 2015; Chowaniec – Gręzak 2016; Gręzak 2018.
[34] Chowaniec et al. 2018, 159.
[35] Apicius 6, 5.
[36] Kokoszko 2011; Chowaniec et al. 2018, 156. The milk was also discovered thanks to lipid analysis.
[37] Stella 2018, 37–52.
[38] King 1999; Wilkins, Hill 2006; Cullota, Barbera 2011; Bowman, Wilson 2013; Fernandes, Chowaniec 2018.
[39] Sirago 1995, 174; Wilson 2013a; MacKinnon 2015; Hughes 2014; Chowaniec 2016; De Angelis 2016.
[40] Smith 1996; Hughes 2014, 68–87; Chowaniec 2016.
[41] On the reconstruction of the environment in which animals lived, cf. MacKinnon 2014, 159. 160 f. 166.
[42] With previous literature, cf. Chowaniec 2015b; Cugno 2018; Lanteri 2018.

## Image Credits

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# Ambiente ed economia nell'hinterland di Himera (Sicilia settentrionale), dalla preistoria alla prima età medievale. Una preliminare analisi comparativa con il comprensorio di Cignana (Agrigento, Sicilia meridionale)

**Oscar Belvedere – Aurelio Burgio**

In una vasta area della Sicilia nord-occidentale (fig. 1), corrispondente al bacino del fiume Imera settentrionale, che nell'antichità rientrava nel territorio della polis di *Himera* (distrutta nel 409 a.C.) e della città di *Thermae Himeraeae* (fondata nel 407 a.C. ed abitata con continuità fino ad oggi), l'Università di Palermo ha condotto, oltre a prospezioni archeologiche a carattere sistematico, una serie di ricerche focalizzate sul contesto paleo-ambientale, il cui approccio, insieme ai risultati preliminari, viene illustrato in questo contributo.[1]

L'area in esame è in prevalenza caratterizzata da un paesaggio collinare solcato da corsi d'acqua (da Ovest ad Est: fiumi S. Leonardo, Torto, Imera settentrionale; torrente Roccella, poco ad Est di Himera) che sfociano nel mare Tirreno, e, nel settore orientale, dal massiccio montuoso delle Madonie, che sfiora i 2000 m s.l.m. L'esame comparativo tra i dati topografici e archeo-ambientali ricavabili dalle prospezioni e dagli scavi effettuati ad Himera e nell'immediato entroterra,[2] e dagli scavi nel riparo sotto-roccia di Vallone Inferno,[3] sulla media valle dell'Imera settentrionale, ha prodotto rilevanti risultati riguardo all'assetto ambientale e al sistema economico del comprensorio imerese. In particolare, la stretta integrazione disciplinare tra archeologia, geomorfologia e studi paleoambientali che informa il progetto di Vallone Inferno – da cui ci si attendono ulteriori precisazioni poiché lo scavo è ancora in corso – ha permesso di ricostruire aspetti essenziali dell'habitat e delle attività antropiche nelle Madonie occidentali, all'interno di un quadro cronologico contraddistinto da datazioni assolute, tra il Pleistocene finale e l'età tardo-antica/bizantina.

Ad Himera, un elevato livello di erosione è ben riconoscibile all'interno dell'area urbana, come documenta il profondo vallone che scorre tra i due terrazzi, di Imera e del Tamburino, sui quali si sviluppa la parte alta della città. L'approfondimento di questo vallone è stato ben messo in evidenza, sia da L. Mauceri circa un secolo fa, sia dallo scavo effettuato negli anni '80 del secolo scorso ai piedi di questo vallone, che ha permesso di riferire tale evoluzione al periodo tardo-antico o medievale.

Considerazioni simili valgono per il comprensorio immediatamente intorno alla città, in particolare per la Piana di Buonfornello, caratterizzata da un potente deposito alluvionale che copre i livelli di età antica tra le foci dei fiumi Torto e Imera settentrionale. In questa fascia dovevano in antico esistere paludi costiere, sfruttate in occasione dell'assedio che la città subì nel 409; peraltro, l'evoluzione della linea di costa, connessa ai fenomeni di esondazione e di trasformazione delle foci dei fiumi, è esplicitamente attestata dal toponimo Canne Masche e riconoscibile nella cartografia storica dell'IGM,[4]

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Fig. 1: Il territorio imerese.

e comprovata dai dati sulla viabilità antica. Infatti, in età romana, il tracciato della *via Valeria* correva qualche km all'interno per aggirare le paludi, come dimostra l'ubicazione del rudere del Ponte della Meretrice, su un'ansa fossile poco distante dall'attuale corso del Torto.[5] A Himera, lo scavo di un'area extraurbana nella Piana di Pestavecchia, il c.d. quartiere Cardillo, e di un ampio settore della necropoli settentrionale, documenta in modo evidente queste trasformazioni.

Le indagini geomorfologiche e geoarcheologiche attestano tale evoluzione paleo-ambientale, che rivela due aspetti, in apparente contraddizione: il passaggio, nel I millennio a.C., da una condizione climatica umida ad una più secca, e nel periodo di vita di Himera la persistenza in pianura di condizioni più umide di quelle attuali, che spiegano la presenza delle zone paludose, funzionali anche ad uno sfruttamento economico. Il fenomeno dell'erosione delle pendici collinari dell'entroterra, che ha certamente inciso molto nelle trasformazioni descritte, era attivo già in età tardo-arcaica e classica: alcuni siti sono ubicati infatti su paleofrane stabilizzate o intorno ad esse, e le sepolture più antiche (fine VI–inizio V sec. a.C.) della necropoli di Cozzo Scacciapidocchi, a Sud di Himera, sono state scavate all'interno di un orizzonte colluviale già parzialmente eroso. Si è pertanto ipotizzato che lo sviluppo dell'agricoltura possa aver contribuito all'attivazione del fenomeno dell'erosione, tanto più che gli Imeresi intrapresero ben presto la coltivazione delle aree prossime alla città: lo studio dei sedimenti del contesto

di Cardillo attesta infatti che la Piana fu coltivata già prima dell'inizio del VI sec. a.C., quando fu realizzato il quartiere suburbano. La contrazione – progressiva da età antica ad età medievale e moderna – della copertura boschiva, e in generale il denudamento dei versanti legato alle pratiche agricole con conseguente formazione di un paesaggio aperto e degradato potrebbe aver dato maggiore consistenza ai depositi alluvionali e al mutamento del regime idrico dei corsi fluviali.

Ulteriori conferme provengono dai dati dello scavo Vallone Inferno: a ripetuti eventi geo-morfologici, a carattere parossistico, si deve il riempimento del riparo in età post-antica e la successiva erosione che ne ha messo in luce un'ampia sezione. È verosimile che analoghe sequenze abbiano interessato altri corsi d'acqua del complesso madonita, tanto più che lungo l'Imera sono presenti estese aree calanchive, i cui apporti detritici potrebbero avere prodotto ripercussioni sulla fascia costiera. Di grande interesse i dati archeobotanici di Vallone Inferno[6]: in ciascuno dei periodi attestati la coltivazione del grano e dell'orzo erano pratiche prevalenti, gli olivi gli alberi da frutto più comuni (come peraltro nel paesaggio attuale); attestata anche la coltivazione di leguminose, mentre la vite solo nei livelli di età tardoantica/bizantina. Ovicaprini e maiale rappresentano il 50% della fauna riconosciuta, e i bovidi sono documentati nei livelli di età preistorica e bizantina/tardoantica. Frassino e acero erano specie arboree abbastanza comuni, e la quercia prevaleva in assoluto in ogni periodo; come documenta anche la toponomastica *Quercus suber* e *Quercus ilex* erano dunque ben presenti nel comprensorio imerese, dove permangono lembi di bosco, composto da querce, lecci, roverelle, e altre piante tipiche della macchia mediterranea. Nei boschi si praticava, oltre all'allevamento, la caccia, e i cervidi sembrano essere tra le specie diffuse, come ancora una volta suggerisce la toponomastica.

Le trasformazioni nell'assetto idrografico sono confermate sia da dati archeologici, come l'ubicazione del pilone del ponte romano (il Ponte della Meretrice) sul versante sinistro del Torto, sia da analisi da telerilevamento effettuate sul basso corso dell'Imera.

O. B.

L'approccio paleo-ambientale – anche se al momento con un limitato supporto di dati di scavo – interessa anche il comprensorio di Cignana, prossimo alla costa meridionale della Sicilia: qui tra il 1992 e il 2006 la Soprintendenza BB.CC.AA. di Agrigento ha effettuato alcune campagne di scavo nell'area di una villa romana (la villa di località Cignana),[7] e dal 2007 l'Università di Palermo svolge un progetto di prospezione archeologica a carattere intensivo e sistematico (fig. 2).[8]

Il comprensorio, collinare, è molto diverso sia dal punto di vista geo-morfologico che ambientale rispetto al territorio imerese. La piovosità media è ben minore, le aree boschive e di macchia mediterranea quasi del tutto assenti; i valloni hanno breve corso e limitata portata, come pure i due fiumi che limitano ad Est e ad Ovest l'area della ricerca, rispettivamente i fiumi Palma e Naro; verso l'interno, il comprensorio è chiuso da una serie di colline, culminanti nei terrazzi pleistocenici di Monte Narbone e


Fig. 2: Il territorio di Cignana.

Piana di Cignana, caratterizzati da ampi affioramenti arenacei e da numerose sorgenti, presso le quali si localizzano di solito i principali insediamenti. Dal punto di vista storico-archeologico le testimonianze di vita si dispongono dalla preistoria (Neolitico) all'età medievale, e un ruolo importante ha avuto in ogni tempo il sistema viario, dal momento che l'area è attraversata dalla via paracostiera che unisce l'est e l'ovest della Sicilia e lambita a Nord da una via che in età tardo-antica collegava Agrigento a Catania.

Gli scavi nell'area della villa hanno documentato un consistente deposito alluvionale al di sopra dei livelli dell'età del bronzo,[9] prova di una fase di abbandono e dell'effetto determinato dai fenomeni di erosione delle pendici collinari e di deposito nelle aree a valle sulla visibilità e conservazione dei siti archeologici. Altrove, sulla dorsale di Serra Balate, l'elevata erosione superficiale ha prodotto estese superfici prive di humus, nelle quali mancano quasi del tutto i segni di insediamenti in età antica, a parte labili tracce di rinvenimenti sporadici. Anche l'attività antropica ha inciso profondamente il territorio, specie dove sono state aperte cave di zolfo, che hanno caratterizzano il comprensorio dalla metà del XVI secolo (citate in Tommaso Fazello) al secondo dopoguerra. Nella zona costiera, presso la foce del fiume Palma, è verosimile che esistesse un'ampia area palustre, e uno dei pochi insediamenti qui localizzati, la grande fattoria (o villa?) di età romana in località Mortilli, sfrutta un alto topografico presso una delle sorgenti (di acqua sulfurea) della zona; va ricordato inoltre che proprio la presenza di acque sulfuree ha favorito la conservazione dei noti *xoana* lignei di età arcaica rinvenuti nel vicinissimo santuario di Tumazzo.[10]

A. B.

## Notes

[1] Una più articolata e analitica illustrazione, con bibliografia completa, in Burgio 2018.

[2] Himera I–III; Burgio 2002; Lauro 2009.

[3] Le ricerche sono condotte in collaborazione con l'Università Rovira i Virgili e l'Institut Català de Paleoecologia Humana i Evolució Social di Tarragona. Il sito di Vallone (o Fosso) Inferno occupa una posizione significativa anche in relazione alla viabilità tra l'alta montagna e le dorsali collinari del bacino dell'Imera. Per l'illustrazione della metodologia, del contesto geo-morfologico, e dei primi risultati: Belvedere – Forgia 2010; Forgia et al. 2012; Forgia et al. 2013.

[4] IGM F. 259 (ed. 1875); Carta Geologica, F. 259 (rilievo Baldacci 1880. 1881).

[5] Cucco 2000, 177 fig. 10–12.

[6] Forgia et al. 2013, 121–123 tab. 2. 3.

[7] Rizzo 2010, con bibliografia precedente.

[8] Il progetto è svolto nell'ambito di una convenzione con la Soprintendenza BB.CC.AA. di Agrigento. Per l'analisi dettagliata, primi risultati e bibliografia precedente: Burgio 2013. È in preparazione l'edizione definitiva.

[9] Rizzo – Zambito 2007.

[10] Caputo 1938.

## Image Credits

Fig. 1–2: Map created by the author.

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# Topographical and Urbanistic Considerations Regarding Himera – New Evidence from the Piano del Tamburino

**Elena Mango**

The Piano del Tamburino, an elevated plain overlooking the lower town, has received little attention in more than 50 years of research at the Greek colony of Himera. The Piano del Tamburino is characterized by a relatively flat surface at its center and natural terraces at its perimeters, especially on the east side looking toward the Piano di Imera, likewise an elevated plain. A small valley separates the Piano di Imera and the Piano del Tamburino on their northern sides (fig. 1), while in the south they are joined together. The location of the Piano del Tamburino within the colony, as well as its topographic morphology, offered ideal conditions for urbanization – an urbanization which has begun to take on shape and dimensions through the work carried out by the University of Berne in collaboration with the Archaeological Park of Himera since 2012.

Following initial extensive study of the morphology and topography of these 40 hectares, a wide range of interdisciplinary methods were employed to examine the area: these included aerial and satellite remote sensing, wide geodetic measurements, different non-intrusive methods of prospection – such as geophysical investigations on a large strip 15 hectares in size in the east of the Piano del Tamburino (geomagnetic, georadar, geo-electric measurements and tomography were employed with little discernible results) and extensive & intensive surveys on the Piano del Tamburino. These investigations have been followed by seven excavation campaigns and several campaigns of material studies to date (2018).[1] The results achieved to date from this multidisciplinary approach have provided new insights about the environment and development of the Piano del Tamburino, especially with regard to the relationships and interactions between the natural surroundings and the ancient *polis*, between different urban spaces and, as a consequence, between different social activity zones, all of which will contribute to a new understanding of the cultural landscape of the city.

The above-mentioned surveys yielded an overview of the periods of use of the Piano del Tamburino in antiquity. Traces date back to *prehistoric times*, a large number of stone tools and tool scraps have been found but cannot yet be associated with structures or ceramics. However, they constitute the first tangible signs of human utilization of this area. Should they correspond chronologically with similar findings on the Piano di Imera, which date to the Copper Age,[2] this would suggest in pre-colonial time different nuclei of scattered settlements on both of the elevated plains (fig. 2). Further evidence of prehistoric settlements was found two kilometers away, but the majority of such finds were located more than four kilometers away and thus further distant from the elevated plains of Himera.[3] On the Piano del Tamburino this period seems to be followed by a time gap marked by an absence of traces of settlements or object findings whatsoever until archaic times. The 6th and 5th cent. BC seems to have been the main phase, documented

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Fig. 1: Himera, view from the lower town toward the south.

both by the quantity of material found during the survey and by its broad distribution on the Piano del Tamburino, extending with varying density over the whole elevated plain. After the 5th century BC there is once again a gap with an absence of traces of presence for the next centuries until early Imperial times (some sherds) and – increased in number – tiles and (glazed) ceramics from the Middle Ages, the latter concentrated in the northern part of the Piano del Tamburino.

## Fluvial Landscape

Himera's geographical position, morphological characteristics and surrounding landscape constituted important elements that made this area suitable for settlement, beginning in prehistoric times. Not only its location on the northern shore of Sicily with its orientation towards the Tyrrhenian Sea but also its position at the center of a large bay that was easily reachable from the Sea, and, even more importantly, its location in relation to the fluvial systems in this part of the island and the corresponding hydric basins of the Imera Settentrionale and the river Torto (fig. 3)[4] were key contributing elements. Rivers *do* influence settlement locations. They were simultaneously a source of life, a border or a communication line, a transportation route as well as of strategic military importance. The two rivers that border Himera provide fresh water and the plain of agricultural land along the rivers forms a fertile inland stretch ideal for pastures and livestock breeding. The watershed between the northern and southern part of the island also assured the passage from the Tyrrhenian Sea to the Mediterranean Sea on a land route. Complete social and environmental contexts evolve around rivers and develop over time[5] – 'fluvial landscapes' are not a static backdrop to historical narratives, but a direct influence and determining factor.

It would appear that remains of the oldest dwellings from the earliest period after the foundation of the colony in 649 BC navigate around the river, on the one hand, west (in the area of the lower town) and east of the delta of the Imera Settentrionale (the so-

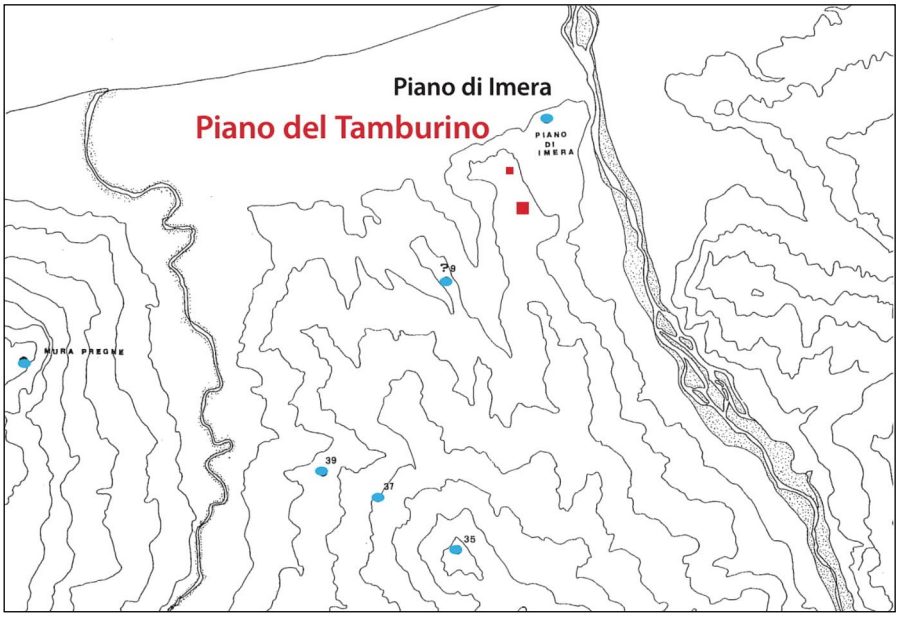


Fig. 2: Finds from prehistoric times in the territory.

called extra urban quartier, that according to Allegro,[6] was bound to mercantile aspects), and on the other hand on the Piano di Imera where also a sanctuary and a regular urban system date back to this earliest period (fig. 4). The dwellings on both side of the river clearly indicate that the river did not mark the limits of the city; on the contrary, it *connected* the two parts and roads that lead along the coast to the east and west of the island connected the colony with other settlements. On the Piano del Tamburino, however, to date – aside from the presumed scattered villages from prehistoric times already referred to – no ceramics or structures from the first period of the colony have been found. This could simply be coincidental, or – if the river really had played such an important role in the context of the foundation – a significant element. During the first half of the 6th century BC all the areas with older dwellings from the 7th century BC (fig. 4) – according to the results of our project likewise on the Piano del Tamburino – a regular urbanistic system was developed that continued to be used until the destruction of the polis in 409 BC.

## Piano del Tamburino – Area 11 and Area 12

The archaeological evidence from seven excavation campaigns to date has provided new insights into the environment and development of the Piano del Tamburino that are contributing to a new understanding of the cultural landscape of the city. After several contemporary fires that burnt the vegetation away, the existence of a water source on the Piano del Tamburino clearly came to light (fig. 5). There were earlier indications

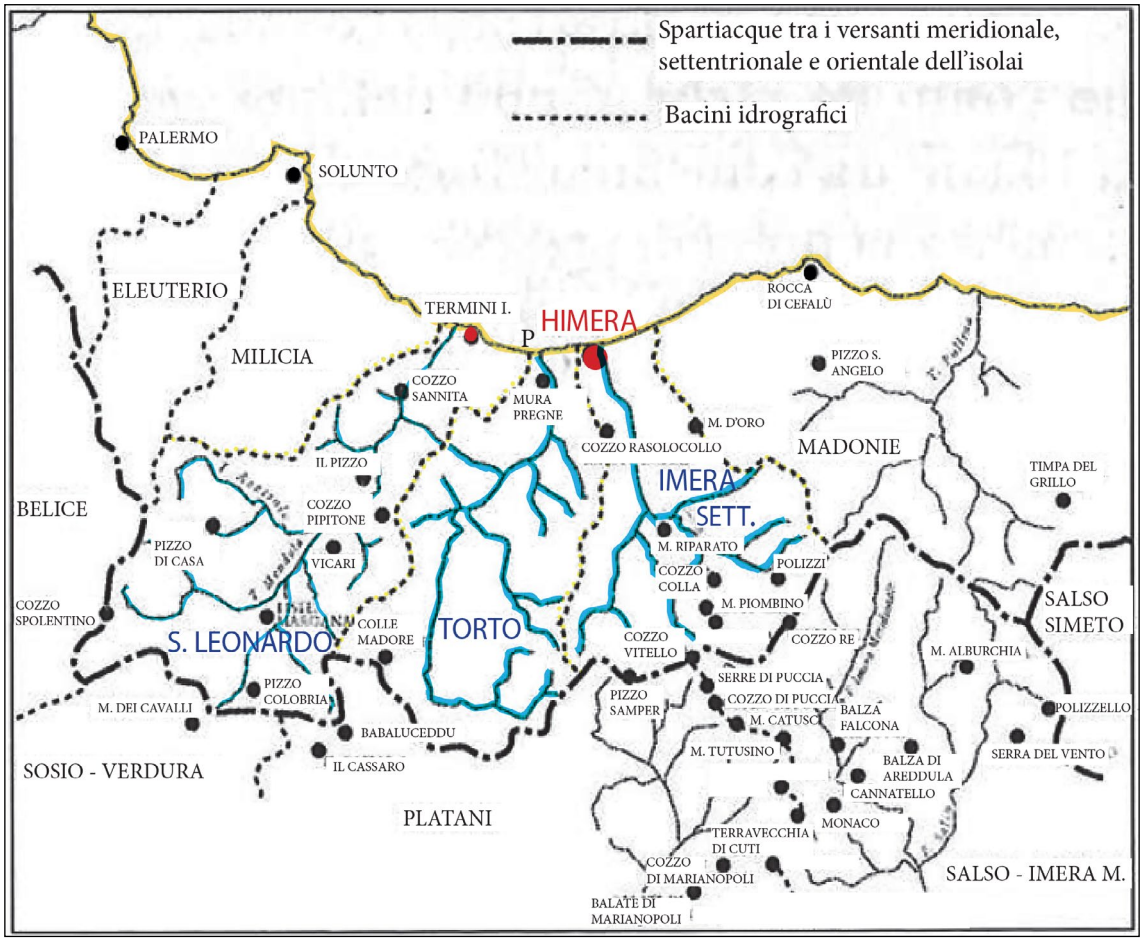


Fig. 3: Settlements in relation to hydric basins.

of the existence of such a source or a water vein, such as the presence of canes in the northern part of the Piano del Tamburino. The fires of summer 2017 made it possible to determine the exact location of the modern capture of the source, as well as the modern water channel that leads toward the lower town (fig. 5 lower right, leading to a Hotel). Water certainly was of *primary* importance for the city, especially given the fact that no water source exists on the Piano di Imera.

The evidence collected to date in so-called area 11 and area 12 – e.g. a large variety of types of deposits and altars – strongly suggests a sacred character of the two areas. Water would seem to be one of the determinant elements with regard to the position of these sanctuaries. The position of the source in antiquity and its exact relation to the sanctuaries, however, remains to be investigated.

Area 11 is characterized by an astylos temple, open toward the east, with an enclosure wall around it and a zone of votives west of it that seems related to a stone pile altar that was found south of this zone. The different types of deposits that have been found suggest that area 11 might be related to a female deity.

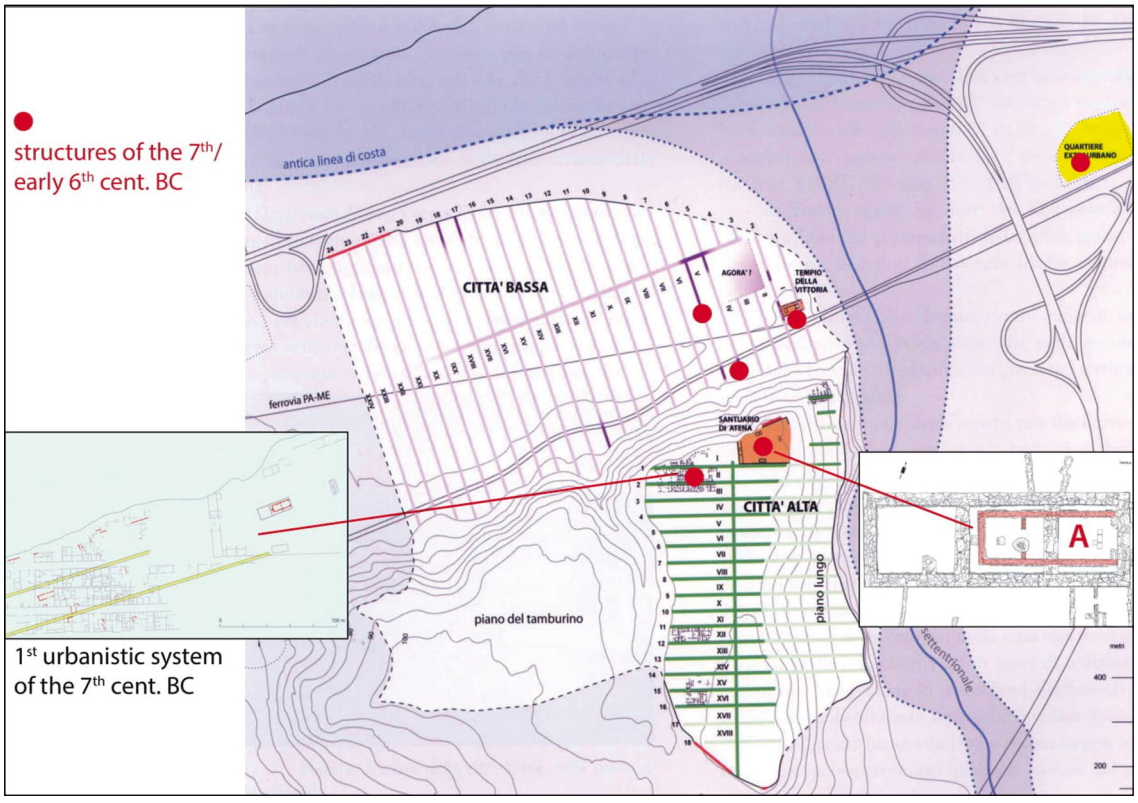


Fig. 4: Himera, urban plan with remains of structures of the 7th/early 6th century BC known to date.

Area 12, however, demonstrates a completely different architectural character in comparison with area 11 (fig. 6). The northern part consists of a large hypaethral space (open space) that is delimited to date on three sides: on the north by a wall running east-west; on the south by a partly excavated building with several rooms (A, B, C, D); and in the east by another building. Within the open space with a surface >100m$^2$ as delimited to date, three altars and numerous small deposition pits and *Bothroi* have been found (green and blue crosses, triangles, squares, fig. 6). A large variety of types of deposits, to date more than fifty in number, allow us to physically sense the materiality of the rituals: features from the numerous votive pits and bothroi, the manner with which specific objects were deposed, their frequent fragmentation (as if intentionally broken), the deliberate perforation of the bottoms of ceramic vessels, the positioning of vessels up-side-down and the vastness of the open space with various altars demonstrates parallels with sanctuaries of female divinities, e.g., chthonic divinities such as Demeter and Kore or the sanctuaries of the Nymphs, of Artemis or Aphrodite – the latter having a very close relation to water. Moreover, votive offerings such as an increased number of molds of terracotta figures, scoria, lead fragments as well as distance spacers in clay also reflect artisanal aspects that could have been

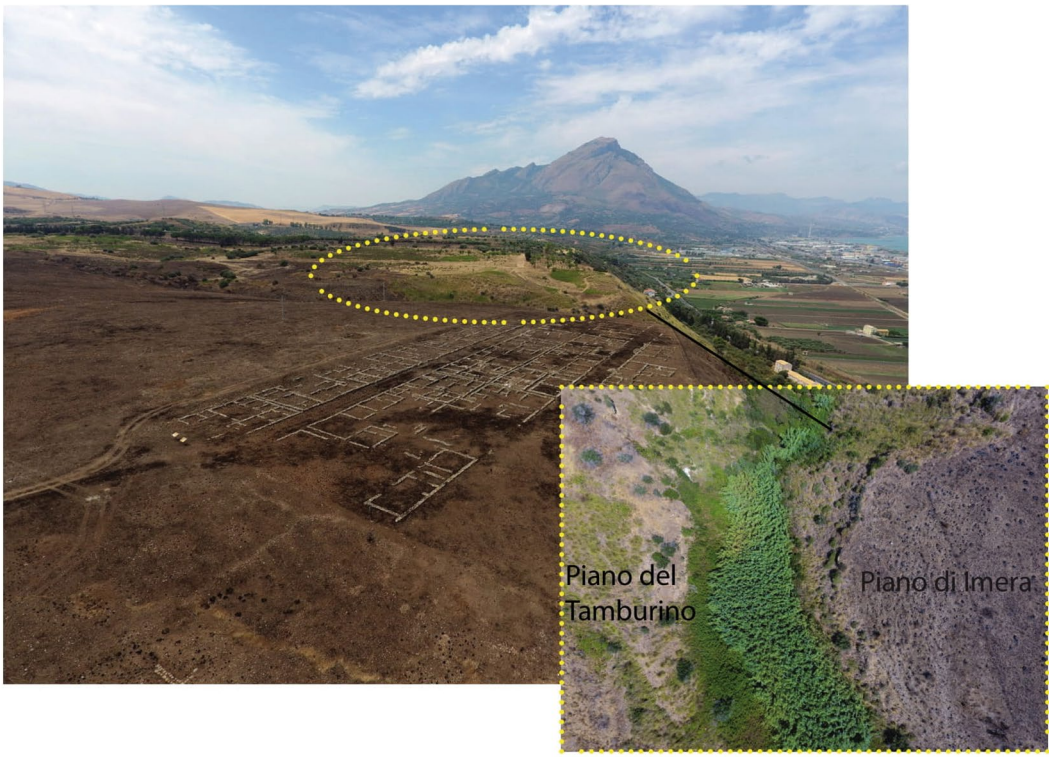


Fig. 5: View from the Piano di Imera toward the Piano del Tamburino, 2017.

connected to cults (Athena?) and/or to the presence of artisanal workshops within or next to the sacred area.

To date, three altars have been located within the open space, suggesting that either several cult deities or different aspects of the same divinity were venerated; or perhaps a sizeable sequence of rituals. The discovery of an apsidal altar (ST43, fig. 6) introduces other possible elements and aspects: This altar contained a consecration deposit consisting of a large number of complete as well as intact objects, including two seated female terracotta figures. One of them, dating to the second half of the 6th century BC, features a mother-goddess sitting on a throne, with diadem and very high polos on her head and had been broken to pieces before the deposition. The other terracotta of younger date (end of 6th/beginning of 5th century BC) was not broken but on the contrary, deposited carefully horizontally within the consecration pit. This one is also seated but wears only a bond in her hair and has no polos, but shows on her breast a *crescent moon* between two discs, a motive well known in the Phoenician-Carthaginian area. These two female terracotta figurines of different dates, one broken in pieces deposited in different parts of the deposition, the other intact and carefully placed down – do they represent two different manners of consecration within the same deposit or are they to be connected to different cults? Or do they possibly represent a succession of cults? At this stage of study, it is not possible to favor one hypothesis or the other; however, the presence


Fig. 6: Himera, Piano del Tamburino, Area 12, schematic plan and photo of absidal altar, details of the consecration deposit of the altar.

of the motive of a crescent moon within a sanctuary in Himera and as *a consecration element of an altar* make it a particularly interesting feature for further study of possible aspects of cults as well as regarding the significance and function of this sacred area for the colony of Himera. Other aspects concerning the ceramic vessels used and deposited in the sacred area and within this altar are also of significance and might point to very specific choices of vessel types (e.g. so-called Castulo-Cups).

## Urbanistic Aspects

Once again with regard to urbanistic aspects, as the title of the paper suggests, all the walls discovered to date in area 11 and area 12 show the same alignment as the 2nd urbanistic plan on the Piano di Imera that was implemented beginning in the second quarter of the 6th century BC. The southern bounding wall of area 12 is in alignment

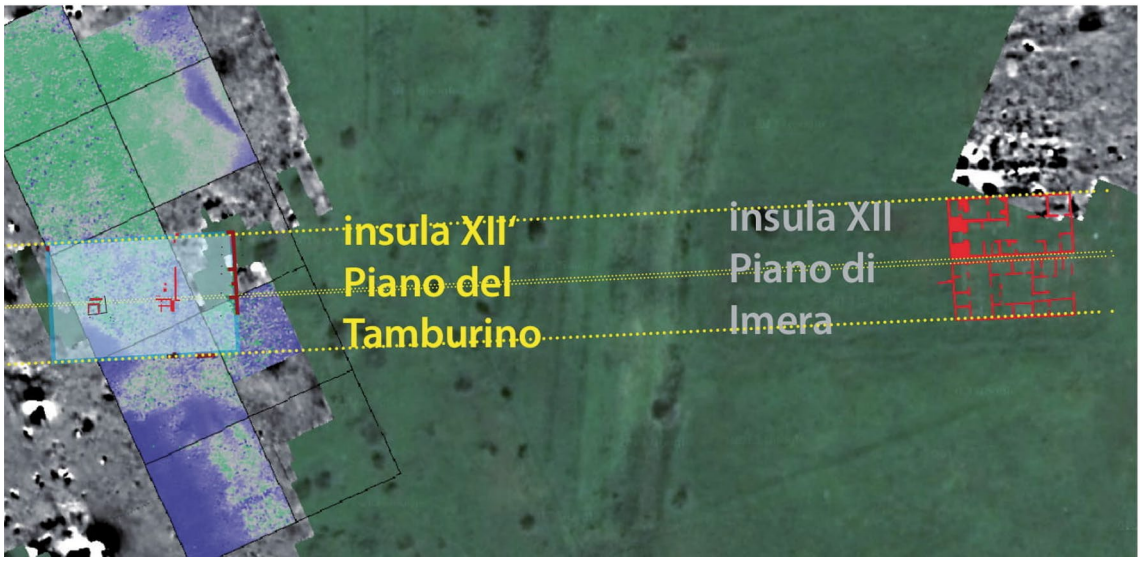


Fig. 7: Himera, Piano del Tamburino, detail with satellite photo and results of the geomagnetic and electric prospections, showing the correlation of the urbanistic system between insula XII on the Piano di Imera and insula XII' on the Piano del Tamburino (Area 12) as well as the delimited area of the insula (light blue) as known to date.

with the south wall of the Insula XII on the Piano di Imera (fig. 7). Not only the alignment but also the width of the *insulae* on the Piano di Imera and the Piano del Tamburino seem to correspond; it is therefore designated as Insula XII' (fig. 7). The area delimited by test trenches of Insula XII' had a surface of about 1500m$^2$, with a north-south extension of 32 meters and an east-west extension of some 48 meters (fig. 8). These dimensions have to be corroborated or relativized by enlarging the test trenches in forthcoming campaigns. Significant questions such as if the regular Insula system continued to the west, north and south and, related to this, if streets bordered the Insula XII' (and if so, what was their width) remain to be investigated. Likewise not yet determined is the question if the delimited surface of about 1500m$^2$ was occupied solely by a sanctuary and various buildings related to a sacred function, or if it also consisted of dwelling and artisan houses. An example of the latter in Himera is provided by the extra-urban quarter situated east of the river Himera Settentrionale, where sacred areas are combined with open spaces and houses. Differently from the latter, that ceased to exist at the beginning of the 5$^{th}$ century BC, the areas on the Piano del Tamburino continued until the end of the century. Although the expanse of the area of Sanctuary 1 in Area 11 is not yet known, it can be stated that the sacred building in it was placed exactly in the center of what would correspond to Insula IX on the Piano di Imera (therefore called Insula IX'). Given the findings that have been investigated to date, the development of area 12 was contemporaneous to the second urbanistic plan on the Piano di Imera and therefore clear proof of the fact that the

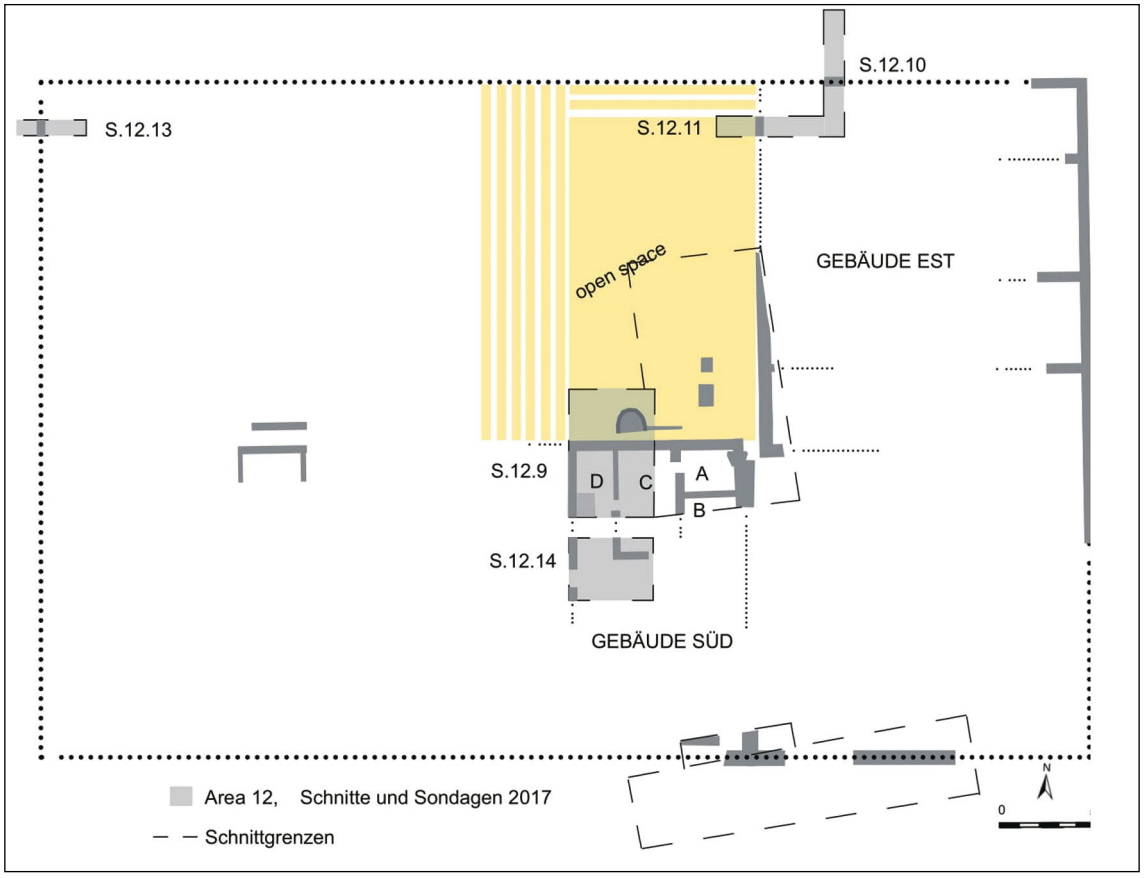


Fig. 8: Himera, Piano del Tamburino, schematic plan of insula XII as currently known (2017).

colony's extension to the Piano del Tamburino goes back to the flourishing phase of the colony in archaic time.

These latest findings give rise to two significant questions: Was all of the Piano del Tamburino systematically urbanized with *insulae* as the Piano di Imera? And, was this urbanization, regardless of its nature, located inside or outside the colony's city walls? The question whether the Piano del Tamburino was "intra- or extra-urban?" is more than 150 years old and began with Luigi Mauceri in 1877 who included the Piano del Tamburino in the perimeter of the city walls.[7] Later excavations by the University of Palermo brought to light part of the southern wall on the Piano di Imera,[8] which is consistent with Mauceri's observations. Since Mauceri researchers have oscillated between complete inclusion, complete exclusion, or partial inclusion.[9] The inclusion of merely a part of the Piano del Tamburino to the urban area of the Greek colony would make Himera one of the largest colonies in Sicily. Following an initial extensive study of the existing literature and of the morphology and topography of the Piano del Tamburino that began in 2012, investigations employing varied geophysical methods

(geomagnetic, geoelectric, electric tomography, georadar) followed. In 2017 we began to investigate the question of 'intra- or extra-urban?' archaeologically – an investigation that is ongoing and that will provide new insights for the better understanding of the colony of Himera.[10]

## Notes

[1] Cf. the yearly appearing preliminary reports: Mango 2013, 2014, 2015, 2016, 2017, 2018.

[2] Cf. Belvedere 1976, passim; Epifanio 1976, 367–372.

[3] Cf. Belvedere 1988, 191–195. Fig. 191.

[4] Cf. Allegro 1999.

[5] Current knowledge of the rural landscape of Himera and of its hinterland is the result of years of research through surveys, paleo-ambiental, geo-morphological and geo-archaeological studies as well as toponomastic studies. Thanks to the research started in the 1960's by Achille Adriani, Nicola Bonacasa and Giulio Schmiedt (1970), but especially pursued by Oscar Belvedere, Rosa Maria Cucco, Aurelio Burgio and others, the archaeological landscape of Himera up to the watershed between the two rivers Imera and Platani, the valleys of Torto and of San Leonardo is one of the best known in Mediterranean archaeology (with a correspondingly rich literature); for a brief overview cf. Burgio 2017 (with bibliography).

[6] Allegro 2014.

[7] Mauceri 1907, 390ff.

[8] Bonacasa Carra 1974, Taf. 3, 3; Himera II, 20 Taf. 105, 1–2.

[9] Schmiedt 1970, 27–29. Bonacasa in Quaderno Imerese 1; Himera II, 661f.; Vassallo 1996; Allegro 1999; Belvedere 2001; Vassallo 2005; Mertens 2006; Vassallo 2010; Vassallo 2013. For a summary of the question, cf. Allegro 2016; Mango 2018, 111–113.

[10] Cf. see for now Mango 2018. For further considerations and results, cf. Mango 2018 (forthcoming); Mango 2019 (forthcoming).

## Image Credits

Fig 1: Photo E. Mango. – Fig 2: Belvedere 2002, 193 fig. 191; color elaboration E. Mango. – Fig. 3: Allegro 1999, 272 Abb. 45; color elaboration E. Mango. – Fig. 4: Combination of different plans and color elaboration E. Mango. – Fig. 5: University of Bern, IAW, Archäologie des Mittelmeerraumes. – Fig. 6: Photos University of Bern, IAW, Archäologie des Mittelmeerraumes, plan E. Mango. – Fig. 7: University of Bern, IAW, Archäologie des Mittelmeerraumes, plan elaboration E. Mango. – Fig. 8: Plan E. Mango.

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# Natural Environmental Factors and Human Settlement in Western Sicily. The Example of *Lilybaeum*

**Annapaola Mosca**

## Premise

We are going to focus on the relationship between environmental factors and human settlement in Western Sicily from the 4th century BC until Late Antiquity in the district east of *Lilybaeum*, between the river Sosio and the lower course of the Mazaro.

The interdependence between cultural landscape and natural environmental factors has been analyzed during archaeological surveys we undertook to understand the changes in settlement patterns.[1] Evidence points to a widespread settlement developed approximately from the end of the 4th century BC but established in the second century BC.[2] At the end of the 7th century AD, there was an apparent contraction of the settlement (fig. 1).

Settlement patterns are linked mainly to the available water and environmental resources, especially with regard to agriculture, but also quarrying activity and sheep farming.

What stands out most is the organization of the settlement: it was possible to identify both large sites and sometimes veritable villages, extending over several hectares, in this case, similar to what has been found in other Sicilian districts. The minor sites are addressed as *villae* or villages.

## The Mazara's District in Antiquity

The most important center located near the coast was *Lilybaeum*, characterized by a significant settlement beginning in the 4th century BC, following the arrival of Punics from after the conquest of *Motya* in 396 BC by the tyrant Dionysus.[3]

This center remains, even in Roman times, a first rank administrative headquarters in the heart of what had been the Punic *eparcheia* formed in western Sicily.[4] *Lilybaeum*, therefore, continued to be a center where multiple cultural elements converged as well as a prominent maritime port, in front of Egadi Islands, with basins surrounded by a series of smaller moors designed to allow the circulation of agricultural products and various goods coming from the *villae* in the hinterland.[5] The city necessarily needed to exploit the resources of the surrounding territory.

The lower course of the Mazaro (about 23 kilometers southeast from *Lilybaeum*), although characterized at times in spring and autumn by the phenomenon called "marrobbio", with sudden changes in water levels due to atmospheric pressure imbalances, was also formerly a safe port for boats (fig. 2). A shelter for boats at the mouth

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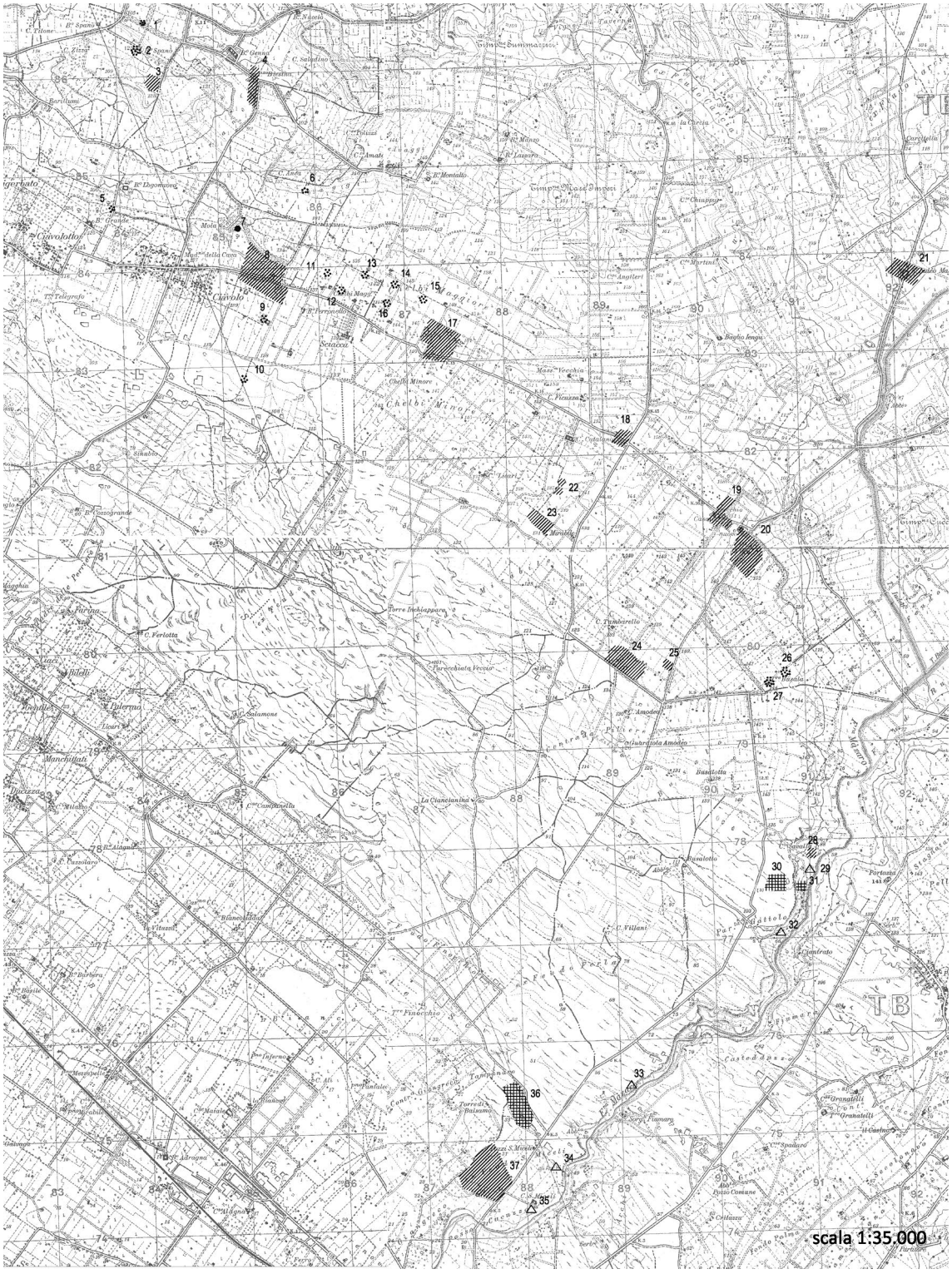


Fig. 1: Archaological map.

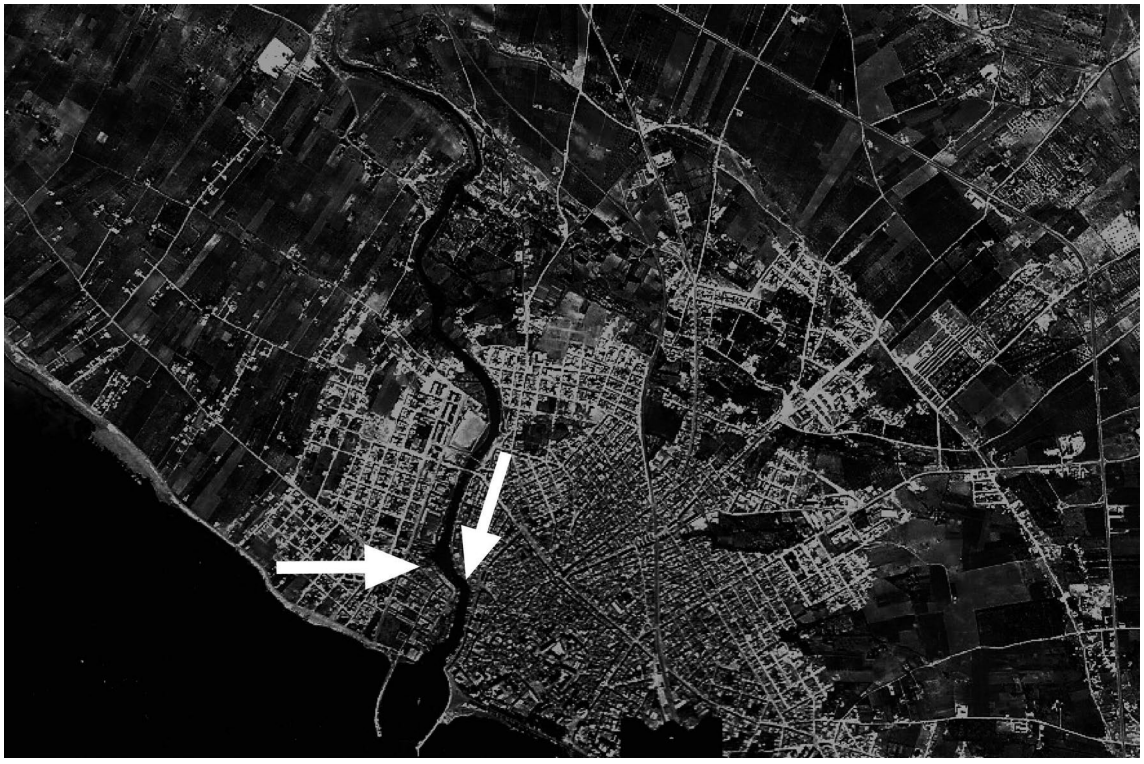

Fig. 2: The lower course of the Mazaro river. The canal-port.

of Mazaro River must have existed since ancient times, as mentioned by Diodorus when he recalls the existence, at the end of the 5th century BC, of a settlement at the mouth of Mazaro.[6] A hoard of coins of the central 5th century BC, with silver coins from the most important cities of Sicily, was discovered there.[7] The lower course of the Mazaro had to be on a border, as it seemed to be controlled for a time by the Selinuntinoi, but also contended by the Punics.[8] The existence of traces of ancient port facilities at the mouth of the canal harbor was confirmed in archaeological excavations.[9] Around the port, there were productive activities since the 4th century BC, with changes in the 3rd century BC.[10] Rhodian amphorae dating back to the 3rd century BC are attested too.[11]

The area connected with the lower course of Mazaro (the subject of the survey) had to acquire progressively importance, especially since the end of the Roman Republican age. Strabo remembers the hydronym, from which the entire district takes its name and he reports that the emporion that belonged to the inhabitants of Segesta (in the area of modern Mazara del Vallo) is 38 *stadia* from *Lilybaeum.* [12]

At the state of research, it is difficult to understand if the territorial district of *Mazaris* was administratively dependent on *Lilybaeum* in Roman times or if it was independent, at least in the Roman imperial age.

Why was this district between the Sosio and the Mazaro important in Antiquity? It was connected to the ports of Mazara and *Lilybaeum.* Plinius highlights the proximity of

Fig. 3: A well covered by a modern domed structure in Chelbi, in an area of ancient settlement.

this territory, especially of the town of *Lilybaeum*, to the African coast, but he emphasizes the possibility of reaching Sardinia or Malta, too.[13] It was not only the possibility of commercial exchanges or the strategic importance facing Africa that made this district prominent, but this area of Sicily was also rich in natural resources.

## Water and Settlement Pattern

How can the supply of water in this territory be described? The medieval and modern Mazara del Vallo had water collection tanks, water being furnished by the hinterland.[14]

The ancient settlements owed their vitality also to the abundant presence of water. It was water, in fact, that allowed for settlement. It has indeed been noticed during the archaeological surveys carried out in the project "Costituzione di poli formativi per la ricerca nel campo dei Beni Culturali, con finalità culturali e di conoscenza dei siti nella provincia di Trapani" that the organization of the settlement was mainly characterized by the presence of groundwater. We have not identified cisterns as in other parts of Sicily or northern Africa. Fragments of *opus signinum* have been highlighted only in Casale Visir / Casale Vecchio (19) and in Biesina (4) and we wonder if they belonged to cisterns where rainwater was collected or if we can hypothesize the presence of *balnea*.

Archaeological data evidences an overlap of settlement phases, although there seems to be a difference in extension between the Hellenistic phases and Imperial times or Late Antiquity. The artifacts that can be dated to the middle Imperial period and late Antiquity seem to be more consistent and occupy a larger surface than the artifacts of the previous phases. Some settlements survive even longer, exactly where sources of

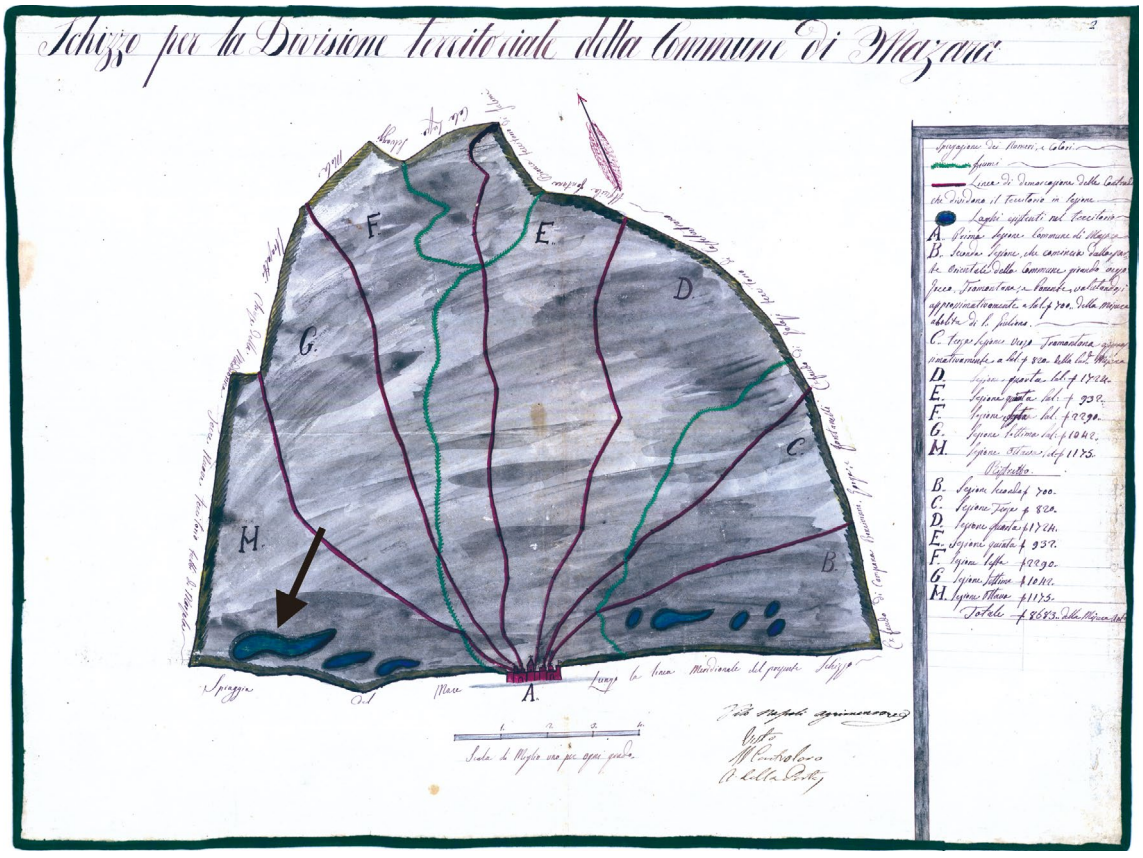


Fig. 4: The coastal lakes in a 19th century map.

water continued to be available, while others seem to have been abandoned.[15] In the area of Chelbi (17), where a well covered by a domed structure is still in use (fig. 3), the settlement has lasted until the Middle Ages.[16] There must have been an aquifer also in Casale Vecchio and Casale Nuovo (19; 20), where settlement is attested in the Middle Ages as well.[17]

A hydrogeological map[18] allows us to understand that the underground water flow has given shape to the ancient settlement. Underground waters from the hills descended towards the plains of the "sciara" to reach the coastline. Based on the groundwater flow it is possible to understand the distribution of the ancient settlement and understand why there was a concentration of sites in certain areas rather than others.

## Natural Resources

The territory object to the archaeological survey, between the Sosio River and the western bank of the Mazaro, though apparently uniform, displays orographic and soil diversity.

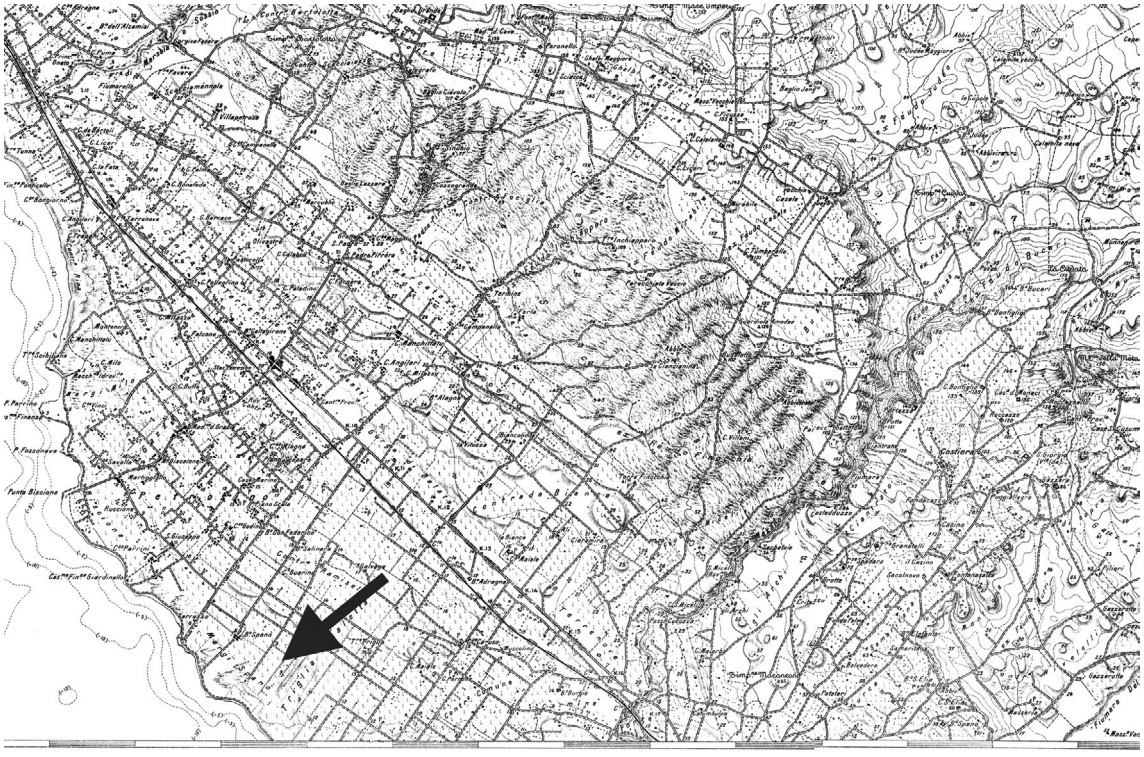

Fig. 5: The area west of Capo Feto.

Along the coast, there were internal lakes, which were caused by marine intrusion. Now they are dried up. These bodies of water were represented in maps of the 19th century[19] (fig. 4) and were probably an important source of income for the local economy, as they had to be containers of a much-diversified fauna and with peculiar vegetation. Over these lakes or around them, migrating birds had to stop. Along the coasts, poplars grew (*Populus alba L.* and *Populous nigra L.*).[20] As the water was seawater, maybe salt was collected in these lakes: as we know, salt was very important in Antiquity, as it was used to preserve food, but it was also essential for animals. Behind the coastal area, there is a strip of land suitable for agriculture (vineyards, cereal crops, olive trees). Traces of a settlement, with an evident phase that can be dated to Imperial Times, have been noted in the area of Baglio Spanò, west of Capo Feto. This settlement had to take advantage of both the natural resources along the coast and the agricultural products of the hinterland. It was located in a sort of hinge between sea and countryside; it was not far from the road that from *Lilybaeum* went towards the river Mazaro (fig. 5).[21]

Some ancient roads led from the coast to the hinterland and had to be travelled by the shepherds who led the flocks from the coast to the Erice Mountain and vice-versa.[22]

The central part of the survey area is called "sciara", a rocky soil left uncultivated, as any type of agricultural farming is impracticable here.

Fig. 6:"Casale Tumbarello": foundations.

The "sciara" was used for the mining of local limestone in the past, in canyons, and via underground exploitation.[23] Squared blocks were extracted in the quarries. Squared blocks were used in buildings, as e.g. it is still possible to see in the area of Tumbarello (24) (fig. 6).[24] Some quarries near the Mazaro River seem to have been abandoned for centuries. The quarries were very close to ancient settlements. For example, the wide quarry called "Garrebbe" (36) was close to San Miceli (37), a settlement that following archaeological data collected during the survey, seems to be datable from the late Republican period to Late Antiquity. It was located at the southern edge of the "sciara", not far from the river Mazaro, in a flat plain where it is possible to practice cereal cultivation.[25]

In the "sciara" , where garrigue is widespread, grow dwarf palms called in Sicilian dialect "giummare" (fig. 7). Their name is *chamaerepes*; in Greek language *chamairepes.* These plants could be used to prepare baskets or could provide insulation from the heat, as Plinius tells us. The leaves were also collected to prepare ropes, folding fans, hats, and other woven goods. The tender shoots are edible. From these palms can be obtained a type of coal that burns slowly.[26] In some ancient settlements in the vicinity

Fig. 7: The "Garrebbe" quarry with a dwarf palm.

of the "sciara"-San Miceli (37), Tumbarello (24), Amodeo (25), Torre Busala (27)-could be practiced some craft activities connected to the "giummare". We have no definite proof; only the ethnographic tradition and Plinius allow us to suppose that some activity, of which no documentation remains, could have been practiced.

In the "sciara" and mostly in the low hills above, as well as long the river Mazaro, there is a widespread presence of *Ferula communis* that characterizes the landscape (fig. 8). It is an umbrelliferous plant of the Mediterranean and known to grow up to three meters. It was widespread in northern Africa and in Sicily, even at higher altitudes than the Marsala- Mazara del Vallo area,[27] in Sardegna, as well as in Greece. It was also known in Rome.[28] This plant was used to make chairs when the stems of the plants were intertwined; with the stems, one could also create "zufoli" (little flutes) for the shepherds.[29] The Greeks distinguished two kinds of *ferula*: *nartheca*, that is to say, the highest plant, and *narthecia*, the one that always remains little.[30] The *Ferula communis* could be used to transport the fire since inside it has a white part that it is consumed only gradually when it catches fire.[31] A resin gum, obtained by incision of the root, was used in traditional medicine against skin diseases, rheumatism, hysteria, and given as vermifugal and analgesic. The seeds and preserved stems of giant *ferula*

Fig. 8: *Ferulae* in the hinterland.

(*Ferula communis*) were eaten in Italy.[32] In Martial *ferula* has been retained to designate the wooden stick used in schools.[33] Some ancient sites – Casa Perrone (8), Chelbi Maggiore (12;16;17) – were inserted in the area between the "sciara" and the hills where *ferula* is more widespread. In the maps of the 19th century, a large property called "Feudo Ferla" is attested in this area.

The northern part of the district is characterized by rolling hills with stony soils, with a maximum altitude of around 180 meters. Cereal crops, plantations, olive trees, and vineyards may have played an important role in the inland economy and it has been hypothesized that there were oaks (*Quercus suber* and *Quercus calliprinus* )[34] in lands unsuitable for agriculture.

Probably agriculture was practiced in this northern area since the end of the 4th century BC: in the Zizza settlement (3) amphorae Vandermersch V, V/VI e VI, probably produced locally, suggest dating the settlement from the end of the 4th century BC until the end of the 3rd century BC. No fragment of black glaze pottery has been found there, but only deteriorated flat tiles. These data lead us to believe that the site was a farm in the middle of a large fertile plateau.[35]

During the archaeological surveys we have carried out, in Chelbi fragments of coarse pottery containers (*pithoi)* have been noted in three sites (13,14,15). These containers coexisted with Greek-Italic amphorae, but no fragment of black glaze pottery has been found; this made us believe that the sites were chiefly designed for farming and storage.[36]

In the settlement of Biesina (4), one of the innermost sites in the territory under examination, it was possible to distinguish a residential part, with an evident phase of 1st–2nd century AD (red slip ware Form Hayes 2,3,8 A) and a productive part, with coarse pottery and containers.

## The Ancient Organization of the Settlement in the Landscape

The organization of the settlement, attested in the investigated area starting from the 4th century BC, with a take-off starting from the Roman Republican age, is determined primarily by the presence of water and other natural resources.

We can say that coastal lagoons and ponds, salt flats, wells of drinkable water, quarries, fertile soil, and the peculiar vegetation have characterized the organization of ancient settlement in the area between *Lilybaeum* and Mazara del Vallo. The irregular distribution of the settlement, characterized by the concentration of sites in some points and not inhabited areas, is due to the distribution of water resources and the presence of the rocky "sciara".

Particular spontaneous vegetation ("giummare" and *ferula*) may have contributed to the local, predominantly agricultural economy (vineyards, cereal crops, olive trees).

The opportunity to practice herding due to the proximity of the coastal salt plains and to the mountain pastures of Erice has also contributed to the formation of ancient settlement and to the creation of a road network that allowed the passage along the coast,

but especially from the coast inside. The presence of the port basins of *Lilybaeum* flanked by the port in the lower course of the Mazaro, was fundamental for the development of the coastal settlement and to ensure contacts with North Africa. The possibility of trade with North Africa due to the proximity to the African coasts probably influenced the wealthy owners in choosing this Sicilian area from the Hellenistic period onwards to build their houses, as well as the possibility of sailing along the coast, as documented by the Itinerarium Maritimum and by the presence of archaeological traces of coast settlements.[37]

The likely exhaustion of some groundwater resources, together with the widespread practice of monoculture (as seems to be attested from the end of the 6th century and the beginning of the 7th century for the supply of the city of Rome), which could have depleted the soil in Late Antiquity, parallel to the cultural and economic change that took place in the Mediterranean at the end of the 7th century, led to an apparent contraction of the settlement. Some agricultural sites, where water resources are still abundant, survived in the following centuries (e.g. Casale Nuovo; Chelbi). These are connected to *Lilybaeum* and *Mazara;*[38] the last one progressively acquired more and more importance in southwestern Sicily.

## Notes

[1] Project "Costituzione di poli formativi per la ricerca nel campo dei Beni Culturali, con finalità culturali e di conoscenza dei siti nella provincia di Trapani"; Mosca 2016, 110–118.

[2] Mosca 2016, 115 f.; vd. Belvedere 1998; Wilson 2000; di Stefano 2002; Cambi 2005; Bowes et al. 2011.

[3] Diod. Sic. 22,10,4.

[4] Tusa 1990; De Vincenzo 2013

[5] Schmiedt 1963; Giglio 2006; Palazzo – Vecchio 2013; Giglio 2014; Giglio 2017.

[6] Diod. Sic. 13,54,6: he uses the word emporion.

[7] Tusa Cutroni 1989; the hoard of coins, made up of silver coins from Agrigento, Catania, Gela, Imera, Leontini, Selinunte, Siracusa, has been dispersed in various collections; it has been dated between 445–435 BC, despite several problems.

[8] Diod. Sic 13.54: during the march of the Punics from Lilybaeum towards Selinunte, the emporion near the river Mazaro is conquered in 409 BC; see also Steph. Byz. s.v. Mazare: he refers to a phrourion belonging to the Selinuntinoi.

[9] Bonanno Marzo 1931.

[10] Giglio 1998.

[11] Denaro 1995.

[12] Strabo 6,2,9; Strabo 6,2,1.

[13] Strabo 6, 2,1, C 265-266; Plinius nat. 3, 87 (distance from the Cap Bon area and from Caralis); 3, 92 (distance from Malta).

[14] See Mosca 2016, 99.

[15] Mosca 2016, 121 f.
[16] Mosca 2016,
[17] Molinari – Valente 1995; Mosca 2016, 120
[18] Gini – Misuraca 2009,178 f.
[19] Caruso – Nobili 2001, maps of the 19th century nos 403 and 405 (Archivio Mortillaro di Villarena).
[20] Gini – Misuraca 2009, 66.
[21] Uggeri 2004, 164; see It. Ant. 88,8
[22] Blake – Shon 2009; Mosca 2016, 110. 122.
[23] Gini – Misuraca 2009, 25 f.
[24] Mosca 2016, 109 fig. 9, 24.
[25] Mosca 2016, 112 fig. 11.
[26] Plin. nat. 13. 28-29; 39; 97; Tamburello 1990, 230.
[27] See Giancuzzi – La Mantia 2004, 265–326.
[28] Ceschin et al. 2004, 73–96.
[29] Plin. nat. 13, 122–126.
[30] Plin. nat. 13, 123.
[31] Hes. Theog. 567; Op. 51: he speaks of a hollow cane. See Frazer 1930, 195.
[32] Plin. nat. 19, 175.
[33] Mart. ep. X.
[34] Gini – Misuraca 2009, 65–71.
[35] Mosca 2016, 111 f.
[36] Mosca 2016, 113.
[37] Fentress 1998.
[38] Mosca 2016, 119 f.

## Image Credits

Fig. 1: Map from Mosca 2016. – Fig. 2: Satellite image IGM. – Fig. 3. 6–8: Photos by the author. – Fig. 4: Map from Caruso-Nobili 2001. – Fig. 5: Map IGM.

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