Research Article

Davide Tanasi*, Enrico Greco

Bigger Fish to Fry: Evidence (or Lack of) for Fish Consumption in Ancient Syracuse (Sicily)

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Abstract: Fish and fish products are considered important sources of nutrition due to their high protein, fat, and fat-soluble vitamin content. These food items have been extensively discussed and celebrated in various genres of Greek literature. However, there is a discrepancy between the rich textual evidence of fish cooking and consumption and the limited archaeological evidence of fishing gear, especially with respect to Greek Sicily. Such scarcity of evidence is particularly evident in the Archaic period. To address the issue of fish consumption in Greek Sicily and to determine the role of fish in the local communities' diet, this study focuses on the new data that have emerged from stable isotopes analysis on skeletal remains from a recently discovered Archaic period necropolis in Syracuse. The study analyzes the dietary habits of the individuals buried in the necropolis and establishes possible connections between burial practices and diet. Additionally, the study compares the dietary patterns with the social status of the individuals, as demonstrated by the funerary context. The comparison of the new evidence with similar contexts will allow for a critical review of the literary sources and the reinterpretation of the archaeological record. Through this, the study aims to establish the role of fish in the diet of the Greeks of Sicily and their significance at the dining table.

Keywords: fish, fishing, diet, nutrition, isotopes, Greek Sicily

1 Introduction

The recent publication of the results of a large-scale isotopic analysis of skeletal remains of 90 individuals from the fifth century BCE necropolis of the Greek colony of Himera, in order to reconstruct dietary habits of that human group, reignited the debate on the dietary regime of ancient Greeks and the role that fish and shellfish had in it. The results of that research (Reitsema, Britney, & Vassallo, 2020) pointed to a diet mostly based on wheat and barley with contributions from other plants, supplemented in variable amounts by animal proteins and with no clear isotopic evidence for fish consumption. This evidence, for how surprising it may be in consideration of the role of fish (especially marine) in the Mediterranean diet and the specific geographic location of ancient Himera – right by the sea and on the island of Sicily, find parallels with other similar isotopic studies carried out in other parts of the Greek world where evidence shows evidence of a diet primarily based on cereals supplemented by animal proteins (in general see: Lagia, Papathanasiou, & Triantaphyllou, 2014; Lagia 2014, 2015a,b. For Metaponto see: Henneberg & Henneberg, 2003. For Apollonia see: Keenleyside, Schwarcz, & Panayotova, 2006).

In order to contribute to this debate and searching for alternative interpretations, this study will reappraise the role of fishing and fish consumption in Greek Sicily in the context of the *Mediterranean Diet Archaeology Project*, developed within the University of South Florida's Institute for the Advanced Study of

*** Corresponding author: Davide Tanasi,** Department of History, University of South Florida, Tampa, Florida, USA, e-mail: dtanasi@usf.edu
Enrico Greco: Department of Chemical and Pharmaceutical Sciences, University of Trieste, Trieste, Italy

Culture and the Environment[1] and spearheaded by authors, and aimed at gaining insight on dietary and culinary habits of ancient communities of the Mediterranean region and the impact on their living standards and health (Greco et al., 2018; Tanasi, Tykot, Vianello, & Hassam, 2017a; Tanasi et al., 2017b, 2018, 2021b; Tanasi, Greco, Pisciotta, & Hassam, 2021a). The approach, integrating the review of written sources and material culture with the results of similar isotopic research will follow the model traced by Vika, Aravantinos, and Richards (2009).

2 Fish, Fishing, and Fish Consumption in Greek Sicily

2.1 Cookbooks and Comedies

Fish and fish products constitute a significant source of nutrition due to their high content of proteins, fats, and fat-soluble vitamins. These food items have been widely celebrated and discussed in various genres of Greek literature. Before discussing in detail what sources have to say, it is important to convey what is the main message that emerges unanimously from ancient authors writing about food in Sicily: Sicily was a food mecca (Wilkins, 2000, pp. 312–368). Availability of superior food produce, renowned chefs, and a natural inclination to enjoy lavish banquets made Sicily a legendary gluttonous Eldorado in the imagination of all the Greeks. Among the Siceliots, the Syracusans particularly distinguished themselves for indulging in the luxury of cooking elaborate and overdressed plates and of organizing lavish and ostentatious symposia (Garcia Soler, 2010). The most significant sources of information on this subject are cookbooks and comedies.

Definitely important must have been the cookbook written in prose by Mithaecus, a cook native to Sicily and active in the late fifth century BCE, who was credited to have brought the secrets of Sicilian gastronomy to Greece. Mentioned by Plato[2] and Athenaeus[3], he is considered the author of the first cook book and among the best Greek cooks ever. Unfortunately, his work, only dated to the Archaic period, is lost with the exception of few fragments.

Another invaluable source is the cookbook of Archestratus of Gela, a Sicilian poet-gastronome who wrote around 330 BCE the parodic epic poem *Life of Luxury*, where he offers hints about the dietary and culinary habits of his fellow Greeks. The work of Archestratus, surviving in 62 fragments reported in the *Philosophers at Dinner* of Athenaeus of Naucratis (second to third century CE) was a sort of gastronomic tour of the Greek World from Sicily and Magna Graecia to Greece and Ionia designed for a sophisticated audience of wealthy food lovers and ambitious chefs. The most rare and expensive ingredients are always warmly suggested to achieve full sensorial satisfaction. Forty-nine out of 62 fragments are dedicated to cooking fish with detailed descriptions of juicy recipes (Wilkins, 2000). The genre of choice, a parodic epic poem, reveals the intent of targeting an upscale audience, while the vast amount of information about various parts of the Greek world shows that Archestratus was definitely mobile in his work as a gastronome. The extraordinary emphasis on fish and fish recipes and the praises sung of certain fish and their exquisite taste speaks volumes about how central it was in Archestratus' cookbooks and in his audience's menus (Montanari, 1999). Fish are described in great detail with common and local names and with specific information about places or waters where one can find the best and the tastiest species. With respect to Sicily, he mentions the superior quality of the tuna and the swordfish and about Syracuse, specifically, he recalls that "The *elops* must be eaten especially in famous Syracuse, for there you will find the very best."[4] But he does not spare critiques towards the questionable taste of the Syracusans of exaggerating with the cheesy gravy: "When working on this delicacy (mullet) do not let

1 https://www.usf.edu/arts-sciences/institutes/iasce/research/med-diet-arch.aspx.
2 Plato, *Gorgias* 518b.
3 Athenaeus, *Deipnosophistae* 12.516c.
4 Athenaeus, *Deipnosophistae* 11.330d.

any Syracusan come near you, for they do not understand how to prepare good fish. They ruin them in a horrible way by 'cheesing' everything…."[5]

Also, very significant is the evidence offered by the comedy, specifically by the Syracusan playwright Epicharmus, considered a pioneer of the Greek comic genre, is also very important. Despite a prolific production, mostly dated between end of the sixth and the first quarter of fifth century BCE, his works survived in 254 fragments cited by later sources. In Epicharmus' play The Muses or The Marriage of Hebe, a description of a lavish fish-centered banquet is described in detail, listing fish and shellfish and indulging on the layout of every single table. The gastronomic luxury portrayed by Epicharmus echoes in the abovementioned work by Archestratus, suggesting that the Greeks of Sicily were always capricious and picky with respect to food.

After Epicharmus, the role of fish becomes prominent in Attic Comedy as is well argued by Wilkins. While in the Old Comedy, fish is just marginally mentioned, which could reflect a non-central role in Attic cuisine, in the Middle and New Comedy, it is perceived as the luxury food *par excellence*, and in that capacity, it is the center of many recurring jokes and scenes, such as the gourmet buying fish at the market or luxurious fish-based banquets and the endless appetite for it of the "parasite" character. Among the decisive factors that determined the transformation of the Old Comedy into the New, through the Middle during the fourth century BCE, are the external influences of the parodies produced by western Greeks such as Mithaecus and Archestratus. The gradual exposure of the Attic public to the peculiar taste in fish of the Siceliots, conveyed by those authors, possibly triggered a progressive change in the culinary habits of the Athenians who ultimately adopted the idea of fish as a luxury food.

Other important reference to the role of fish in Greek Syracuse can be found in Athenaeus' work when he cites older sources. Referencing Phaenias of Eresus, he mentions the story of the fish-based meal at the court of Dionysius the Elder where the poet Philoxenus argued the tyrant to have a fish as large as the one he had (Zoepfell, 1993, pp. 53–54) and in the account of the donation of the Syrakosia ship by Hieron II to Ptolemy with a cargo full of food supplies, he mentions a large amount of salted fish in it[6].

Although this brief survey of historical sources about Greek Sicily seems to portray on fish-consumption as largely popular, it is important to remind that the authors mentioned belonged to a social upper class and that they basically wrote for an audience of their peers. Therefore, while it can be assumed that fish was certainly appreciated and consumed by the elites in the Classical and Hellenistic periods, the same cannot be assumed for the lower classes.

2.2 Fish and Fishing in Figurative Arts and Material Culture

The vast amount of information regarding fish cooking and consumption in Greek Sicily, particularly Syracuse, is in contrast with the limited archaeological evidence of fishing gear. While there are numerous artistic representations depicting the world of fishing and fishmongering, the archaeological record presents scanty evidence for fishing equipment.

In figurative art, we have very limited examples related to the fish world. One example is the couple of dolphins represented on the metope with the Rape of Europa from Selinus, belonging to the Small Metopes group and dated to the first half of the sixth century BCE, where the fish are symbolically evoking the surface of the sea over which the bull carrying Europa is galloping during the voyage (Marconi, 2007, pp. 90–96). However, since the dolphin was not considered an edible fish by the Greeks but a good source for preparation of medicinal products (Mylona, 2009) and considering the mythological setting of the scene, this evidence cannot be used as example for fishing or fish consumption in the Archaic period.

The evidence changes in Classical times, when in the fifth to fourth century BCE, with the emergence of the red-figured Campanian pottery style, fish become a major subject (Trendall, 1983). Besides the example of the

5 Athenaeus *Deipnosophistae* 45.311a; Wilkins and Hill (2011).

6 Athenaeus, *Deipnosophistae* 5.206-09.

krater of the Tuna-seller painter from Lipari (Trendall, 1983), showing a rare example of fish mongering, the vast majority of depictions of fish come from the so called fish-plates (McPhee & Trendall, 1987, 1990). This peculiar class of circular serving dishes (with an average diameter of 17.5/22.5 cm) showing painted figures of fish and shellfish originated in Sicily around 390 BCE, and later influenced Campanian, Apulian, and Paestan production, reaching a peak in circulation in the second half of the fourth century BCE (Mollo, 2007). On the basis of the examples known – 200 Attic plates survive compared with 800 south Italian – such production had a particular appeal over the western Greeks, which employed the fish-plates in both funerary and domestic contexts (Wilkins, 2000). A hypothesis largely sustained about their function is that they were used during the deipnon, the dinner and also the most important meal of the day for the ancient Greeks, as fine ware with representations of wine and the Dionysian world was employed during the symposia where wine played a central role (Wilkins, 2000, p. 339). The plates portray a variety of fish which were likely among the favorites on the Greek table, such as wrasse, mullet, gurnard, bream, perch, octopus, and mussels, as evidenced in a fragmentary example from Syracuse (McPhee & Trendall, 1987).

The only representation of fisherman in sculpture from Greek Sicily is the so-called Pescatore from the district of Achradina at Syracuse (Bonacasa & Joly, 1985, p. 307).

The statue is a Roman Imperial period copy of a Hellenistic original, possibly of Alexandrian production and dated to the last decades of the third century BCE. Comparable to the Vaticano-Louvre type, it depicts an almost naked aged man leaning on a rock with a sort of vine basket by his side. Its iconography gives substance to the poetic description of the fishermen in Theocritus' Idyll XXI,6. The class of terracotta boats with rowers found in votive and funerary contexts in Syracuse and other Sicilian cities between the third and the first century BCE (Basile, 1992) can also relate to maritime imagery, though they are not necessarily related to fishing.

Rather surprisingly, there is a complete lack of evidence on the fishing gear which, as we know from the later account of Oppian of Anazarbus, author of the Halieutiká (On Fishing) in the early third CE, must have counted a numerous set of tools. Although, it is possible that wooden or bone fishhooks did not survive and that terracotta or metal sinkers and weights could have been found but interpreted and classified as something else. Besides the scanty evidence of fishhooks from Himera (Reitsema et al., 2020) and of the terracotta net sinkers from Selinunte (Purpura, 1992, p. 94), no further data are available. It is harder to evaluate the evidence of the bronze net-needles, especially those of larger dimensions which could have been used to sew and repair nets, as an overall study of this class of materials is lacking for Greek Sicily. Definitely connected to a parallel activity are instead the stone devices for coral mining found at Syracuse (Gianfrotta, 2005, p. 98).

A separate discussion would be that of the observation, fishing, and processing facilities for tuna, – largely celebrated by Archestratus – which became rather popular in Sicily starting from the Hellenistic-Early Republican period (Botte, 2018). Important examples of such facilities, whose use continued until the last centuries of the Roman empire, are located in the territory of Syracuse, like that of Ognina (Purpura, 1989), Portopalo (Lena, Basile, & Di Stefano, 1988), Vendicari (Purpura, 1989), and Pachino (Felici, 2012). Their activity, paired with similar evidence from Western Sicily (Purpura, 1982, 1985), testifies to a drastic change in the fishing and fish consumption practices toward a larger and more industrial scale that are ubiquitous in the Roman Mediterranean.

2.3 Fish and Religious Sacrifices

On the threshold between materials evidence and written sources is the discourse on what role fish could have played in the ritual practices orbiting around animal sacrifices to the immortals, a core element of Greek religion. Besides some examples of certain fish being sacred to deities, as mullet to Hecate, and others being the sacrificial victim, as the tuna for its bleeding copiously, fish does not appear to have a relevant role in Greek religion (Carboni, 2016; Ekroth, 2017). Ritual consumption of fish and shellfish is also attested in sanctuaries of Poseidon, like at the Classical site of Kalaureia on the island of Poros (Mylona et al., 2013). The general

exclusion of fish from the pool of the sacrificial animals could be due to fish being a wild rather than domesticated species and therefore less valuable, or to the fish not being able to reach the sacrificial altar willingly as prescribed and customary for other animals.

With respect to Syracuse, according to the sources, the fish from the Arethusa spring in the island of Ortygia were sacred to Artemis, as was the dolphin, which was considered so important to the cult of Artemis Alpheiaia as to become a recurring symbol on Syracusan coins together with Arethusa, an actual mirror image of Artemis herself (Carboni, 2016, p. 265).

At Piazza Duomo in Ortygia, in a 12 m deep votive, well interpreted as being connected with the cult of Artemis and with continuous traces of use ranging from the seventh through the fourth centuries BCE, 491 bone parts were found mixed with a large quantity of ceramic ritual offerings. In that bone assemblage, 19% were Bonito (Sarda sarda) and false albacore (Euthynnus allitteratus) bones (Chilardi, 2006), an evidence that can be linked with that of Kalaureia.

3 The Potential of Isotopic Analyses to Reconstruct Ancient Dietary Regimes

The stable isotope technique is a well-documented method for reconstructing ancient diets and has been applied in numerous regions worldwide (Schoeninger, 2011). In recent decades, the field of stable isotope analysis has progressed, enabling researchers to draw inferences about nutrition, health, and paleopathology (Reitsema, 2013, pp. 450–453). The fundamental principle behind this technique is the correlation between the carbon and nitrogen isotope ratios in bone collagen and bone apatite, and those in the diet (Schoeninger, 2011, p. 445). These values can be better interpreted when compared with those of animal specimens from the same geographic area and time period. Unfortunately, such comparisons were not feasible for this study. However, consumption of fish, particularly marine fish, is generally detectable due to the high nitrogen isotope ratio values.

The ratios of carbon and nitrogen isotopes in human bones are used to reconstruct diet because of the differences in isotopic fractionation of carbon during photosynthesis among various plant groups and variations in assimilation and isotopic fractionation of nitrogen. Plants from temperate regions follow the C3 (Calvin–Benson) pathway, with $\delta^{13}C$ values averaging about −26‰, whereas grasses native to hot, arid environments follow the C4 (Hatch–Slack) pathway, with $\delta^{13}C$ values averaging about −12‰. The carbon isotope values in bone collagen are typically enriched by about +5‰ relative to diet, while bone apatite is enriched by about +12‰. Nitrogen isotope values in bone collagen increase by about +3‰ (Tykot, 2014) for each trophic level. In some isotope studies in Europe and the Mediterranean region, domesticated millet (a C4 plant) has been found (Killgrove & Tykot, 2013), and marine foods have been observed to have a more positive stable carbon isotope value.

In consideration of the prominent role that the Sicilian cuisine had in the Greek culture and specifically of the well-recognized Syracusan fish-based culinary practices, it seems logical to validate what written sources and material culture show us through isotopic research on a community buried in one of the many local necropoleis. However, the opportunity to validate the hypothesis on the dietary habits of the ancient Syracusans via isotopic analyses is tightly connected with the availability of human skeletal remains from secure and properly investigated contexts, which for most of the history of the archaeological research in Syracuse is rather hard to find.

4 Cemeteries of Greek Syracuse

In order to assess the viability of the research framework, it would be worth to outline the current state of knowledge on cemeteries and burial practices in the polis from the Archaic to the Hellenistic period.

4.1 Earliest Excavations

The evidence of rites and customs of a funerary religion of Archaic Sicily comes mainly from the results of the excavations carried out by Paolo Orsi in the nineteenth century in the necropoleis of some of the very important Greek colonies (Leighton, 1986). Despite the historical period, at the dawn of archaeological research in Italy, Orsi's scientific method of excavation and data recording enabled him to deduce the crucial aspects of burial practices of the Greeks of Sicily. The exhaustive exploration of the cemetery of Fusco (Orsi, 1894, 1895, 1897), Giardino Spagna (Orsi, 1925), and Borgata Santa Lucia (Orsi, 1915) at Syracuse allowed him to reconstruct the main patterns of the funerary rituals from the eighth century BCE onward, providing significant observations about tomb typologies, burial practices, and treatment of the corpses and composition of the funerary assemblages. The subsequent excavations carried out at various times between the 1940s and 1990s contributed to the further discovery of portions of the already known necropoleis and located new cemeterial areas such as Ex Giardino Spagna - Ospedale Civile (Agnello, 1949a, b; Cultrera, 1943; Voza, 1976–1977), Viale Paolo Orsi (Gentili, 1951, 1954), and Fusco (Basile, 1993–1994) supplementing the general picture sketched up by Orsi and contributing to the study of the topography of the ancient Corinthian colony (Lanza, 1989) (Figure 1).

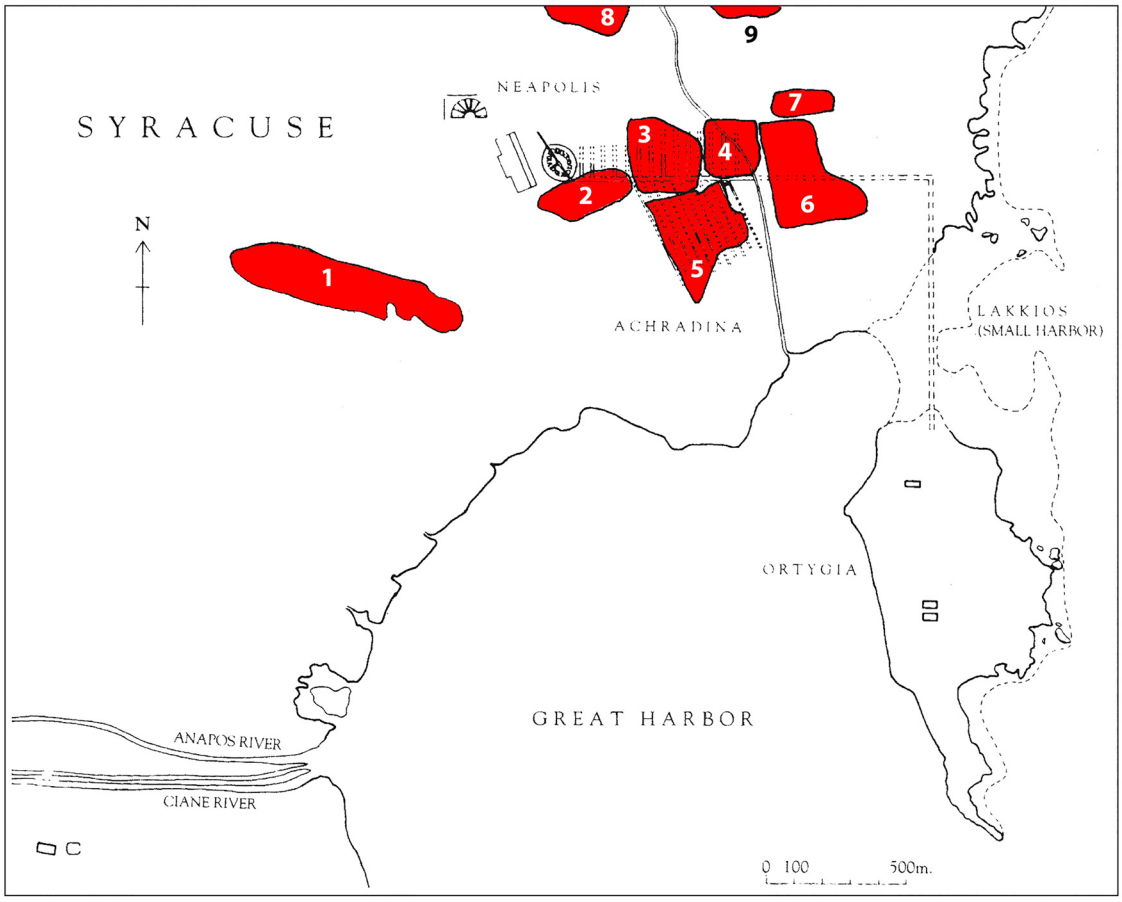

Figure 1: Ancient necropoleis of Syracuse: 1. Fusco (late eighth to third BCE); 2. Viale Paolo Orsi (second half of the seventh to early fifth BCE); 3. Giardino Spagna/Ospedale Civile (second half of the seventh to fourth BCE); 4. Piazza della Vittoria/Santuario Madonna delle Lacrime (second half of the seventh to fourth BCE); 5. Via Testaferrata, Corso Gelone, and via Monsignor Carabelli (sixth BCE); 6. Viale Teocrito, Viale Luigi Cadorna, Via Agrigento, Piazza Santa Lucia, Via dello Stadio (second half of the seventh to first half of the fifth BCE); 7. Santa Maria di Gesù (second half of the seventh to first half of the sixth BCE); 8. Grotticelli (fifth BCE to Byzantine period); 9. Casale (third to second BCE) (after Lanza, 1989).

However, results of those earliest explorations were always published in the form of very brief preliminary reports, a fact that over time diminished the importance of the discoveries. Although the materials provided by the investigations of Orsi and the archaeologists who worked after him now represent the most important part of the Greek collection of the Archaeological Museum "Paolo Orsi" of Syracuse, the lack of critically analyzed contexts has somehow prevented the reconstruction of a general picture. In fact, any subsequent attempts by scholars to produce an overall study about funerary practices of the Archaic city have been conditioned by the incompleteness of the available data and are destined to be under judgment until the day of the final publications of the most recent excavations and the critical revision of the oldest ones (Shepherd, 1995, 2005, 2013).

In some cases, the skeletal remains collected during the earliest excavations were not kept, according to the fashion of the times in archaeology, while in others, the results of the excavation were mostly published in a very preliminary form. Therefore, there is no opportunity to focus on such cemeteries for a large-scale isotopic study of ancient individuals.

4.2 Via Mazzanti/Viale Santa Panagia/Viale Scala Greca Cemetery (1988–2019)

In 1988, the exploration of a new necropolis by the Superintendence of Cultural Heritage of Syracuse began in the northern suburb of the city, in several large plots of land traversed by Viale Santa Panagia, one of the most important arterial roads connecting Syracuse with its hinterland. That fieldwork represented the completion of a previous excavation of two small groups of Archaic graves discovered in 1959 (Gentili, 1961). The excavation was developed at various times throughout 1988 and 1999 with a later intervention in 2002, focusing on different zones such as the large open plot south of Via Mazzanti (Figure 2, no. 1), the Viale Santa Panagia itself, during restoration works of the roadway (Figure 2, no. 2) and partly the plot comprised by Via Mazzanti and Viale Santa Panagia (Guzzardi, 1993–1994, 2003). The discovery of more than 400 tombs in those areas defined another important funerary group of the Greek city to be added to those already known (Germanà, 2011). Fortunately, the publication of the excavation of the Viale Santa Panagia necropolis, even if it is a very preliminary report, provided for the first time a large amount of data about the age and gender of the dead, burial customs, and general rules defining the so called "Syracusan burial system" (Shepherd, 2013). However, besides a very preliminary publication by Guzzardi, which details the discoveries in the area in front of the church (Figure 2, no. 2), all the rest of the evidence is still unpublished.

Figure 2: Aerial photo indicating the cemetery complex of Via Mazzanti (1), Viale Santa Panagia – overlay from Guzzardi (2003) (2), Viale Scala Greca (3), and Viale Santa Panagia/LIDL (4).

In 2010, a large cemetery was discovered by the Superintendence of Cultural Heritage of Syracuse during an infrastructural project in an area between Viale Scala Greca and Viale Santa Panagia. The cemetery consisted mostly of rock-cut fossa graves and contained 135 burials, which were organized into four groups (Tanasi, Lanteri, & Hassam, 2016), whose features were all in all comparable with the context represented by the cemeteries of Viale Santa Panagia/Via Mazzanti (Figure 2, no. 3). In summer 2019, during the construction of a large LIDL supermarket complex in a plot along Viale Santa Panagia, south of the Madre di Dio church, another large portion of a cemetery, counting almost 200 rock-cut fossae, was uncovered (Figure 2, no. 4). This cemetery, represents the spatial link between the two cores of Viale Santa Panagia/Via Mazzanti on the East and Viale Scala Greca on the West, testifying to the likely presence of a vast necropolis set in an area of grossly 700 m (E–W) and 200 m (N–S). The evidence from these two important districts of what seems to be one of the major necropoleis of Greek Syracuse represent the ideal case study for the application of an isotopic research of the ancient diet.

5 Case Study of the Viale Scala Greca Necropolis (2010–2011)

Since the findings of the 2019 excavation are still being processed, this contribution will primarily focus on the Viale Scala Greca necropolis. The cemetery is oriented from East to West and extends for 180 m, with the most western graves located near the Viale Santa Panagia/LIDL complex, and the last tombs identified on the eastern edge located approximately 190 m away. It is highly likely that this area represents the westward extension of the cemetery of Santa Panagia. The cemetery is divided into four main groups (I-IV), and the central part of the cemetery is crossed by a quarry cut, which was probably established at the beginning of the past century, and resulted in the destruction of several tombs, creating a topographic gap in the layout of the cemetery (Figure 3). Similar traces of the same quarry were also found during the earliest excavation of the tombs in Viale Santa Panagia/Via Mazzanti/Via Bulgaria (Gentili, 1961, p. 406).

The scattered distribution of graves within the western Groups I and II along Viale Scala Greca suggests that these groups may have functioned as the periphery, or even the boundary, of a larger cemetery belt extending approximately 700 m from the “Muro di Gelone” in the east to the present-day Viale Scala Greca in the west. During the Archaic period, this complex likely served as a demarcation, indicating the limit of the urbanized region on the northern side.

5.1 Tomb Typologies and Burial Practices

Regarding the types of tombs and burial customs of the 135 graves, 117 were carved into rock fossae, 15 were cremations with ashes stored in amphorae, 1 was a cremation inside a fossa, and 2 were tile graves. Among the 117 well-preserved fossae, 10 were almost entirely destroyed by the quarry.

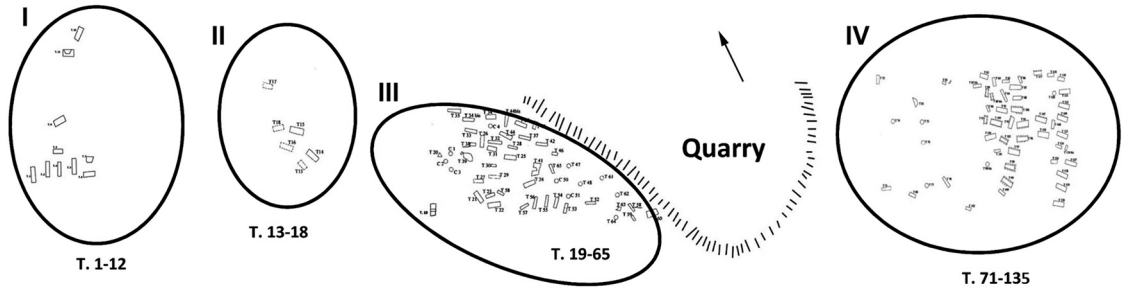

Figure 3: General plan of the necropolis with indication of the four groups (Tanasi et al., 2017a).

Figure 4: Tomb 9 after discovery, Group I.

5.1.1 Rock Cut Fossae

The predominant burial type in the cemetery is the rock cut *fossae*, which are commonly referred to as pit graves. The well-preserved fossae were covered by three or four large stone slabs arranged with rock debris shards and small rocks, or alternatively, with rectangular slabs of stone (Figure 4). In some cases, a row of stone blocks is set along one side to make it even with the opposite side that is carved at a higher level. This configuration is less common, and it may occur on both long sides of the tomb. Many tombs have a deep ledge around the upper edge to accommodate the stone slabs used for the cover.

Based on the 98 better preserved examples, the dimensions of the pit graves can be categorized as follows (Table 1, Figure 5). The average depth of the tombs ranges between 45 and 65 cm (Figures 5 and 6), except for tomb 22 (80 cm) and tomb 23 (10 cm).

Concerning the pit graves' architectural features and shape, most of them have a rectangular form except for 16 tombs that have an irregular shape. The majority of the graves, 14 out of 135, show a carved ledge around the inner perimeter of the cut to place the stone slabs or tiles used as cover. In three tombs, specifically tombs 9, 122, and 135, three large and thick stone rectangular slabs were found *in situ*. Furthermore, 19 graves without any carved ledge were also covered with stone slabs. In one case, tomb 20, two terracotta tile covers of the grave were found intact. However, in all other cases, it was not possible to determine the coverage system clearly as the topsoil was disturbed down to the height of the tombs due to activities carried out in the field where the necropolis lies. Of the 117 fossae, 72 produced skeletal remains and grave goods, while 28 produced just skeletal remains and 18 were completely empty, probably ransacked and emptied out in the past (Figure 7). All the graves show single burials with the exception of tomb 25 which contained two superimposed individuals, arranged with one's skull above the other's feet (Figure 8). As the primary burial was without grave goods, it is reasonable to argue that the tomb was reopened and partly plundered before the placement of the secondary burial.

The majority of the graves are oriented east–west, although some exceptions occur. The skeletons were laid supine with the back of the skull touching the wall and with arms and legs extended, except for tombs 15 and 29 where legs are contracted. Among the fossae no infant burials are reported and as the osteological survey is still ongoing nothing can be inferred about juvenile burials. However, considering that 35 tombs have dimensions ranging between 0.80 m (length) × 0.40 m (width) and 1.20 m (length) × 0.60 m (width), it is reasonable to expect burials of infants and children.

5.1.2 Cremation burials

With regard to cremation burials (Figures 9 and 10), in 15 cases, the ashes were collected and put together with grave goods inside of amphorae laid on one side in shallow and irregular pits, then covered with earth, with

Table 1: Fifteen sampled individuals with the status hypothesized on the basis of the funerary assemblage of the tombs

Tomb	Number of objects	Type of objects	Dimensions	Architectural features	Sex	Age	Hypothesized status of the dead
28	6	Askos #41 Skyphos #42 Olpe # 43 Lekythos #44 Guttus #45 Skyphos #46	160/175 cm × 40/70 cm	Ledge just on one side	Not identifiable	Adult	Wealthy
40	2	Lekythos #62 Bronze needle #63	140/155 cm × 40/55 cm	Ledge	Not identifiable	Adult	Wealthy
42	0	Empty	160/175 cm × 40/70 cm	Irregular shape	Male	Adult	Poor
44bis	1	Bronze needle	180/195 cm × 40/80 cm	Irregular shape	Not identifiable	Adult	Poor
49	0	Empty	160/175 cm × 40/70 cm	Irregular shape	Not identifiable	Young adult	Poor
52	0	Empty	160/175 cm × 40/70 cm	Irregular shape	Female	Adult	Poor
54	1	Bronze needle	160/175 cm × 40/70 cm	Irregular shape	Female	Adult	Poor
57	0	Empty	140/155 cm × 40/55 cm	Irregular shape	Female	Adult	Poor
69	0	Empty	180/195 cm × 40/80 cm	Ledge	Not identifiable	Not identifiable	Poor
70	1	Iron sword	180/195 cm × 40/80 cm	No particular features	Male	Young adult	Wealthy
78	0	Empty	160/175 cm × 40/70 cm	Very shallow	Not identifiable	Not identifiable	Poor
95	3	Lekythos #41 Terracotta figurine #42 Skyphos #43	180/195 cm × 40/80 cm	No particular features	Male	Adult	Wealthy
98	3	Lekythos #54 Skyphos #55 Bronze tweezer #56	180/195 cm × 40/80 cm	Stone slabs	Not identifiable	Not identifiable	Wealthy
99	1	Cup #53	140/155 cm × 40/55 cm	Irregular	Not identifiable	Not identifiable	Poor
107	1	Skyphos #57	180/195 cm × 40/80 cm	Irregular	Not identifiable	Not identifiable	Poor

Figure 5: Tomb 5, Group I (Tanasi et al., 2017a).

Figure 6: Tomb 22, Group III (Tanasi et al., 2017a).

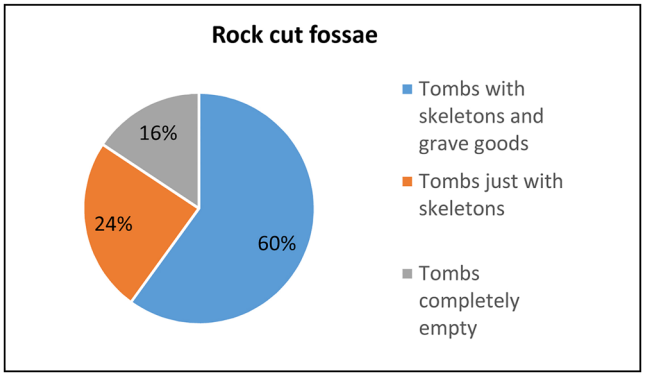

Figure 7: Pie chart showing data about grave goods and skeletal remains in rock cut fossae.

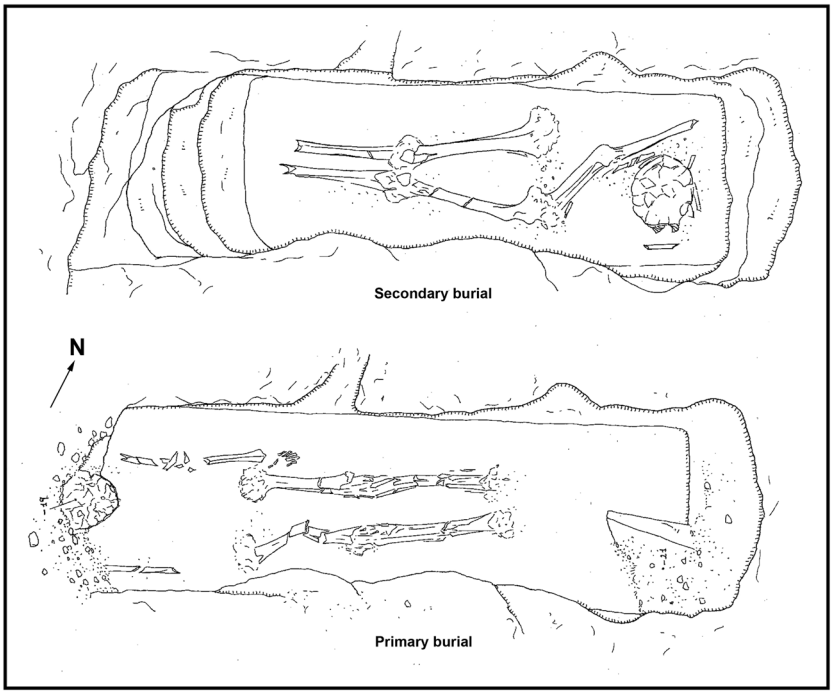

Figure 8: Plan of tomb 25 with indication of the two burials.

the exception of tomb 120 (Figure 14), where the amphora was placed standing on its base and inserted in a deeper pit. The amphorae have very different dimensions and typologies which shows us the absence of a standard container used for funerary purposes. The areas surrounding the cremation burials did not show traces of burning, so the funeral pyres were probably set elsewhere. In terms of spatial organization, the cremation burials are concentrated in Group III and IV and in general are very close to one another.

Unique is the case of tomb 34, a rock-cut fossa with the upper part of the side walls built with stone blocks inside of which were found remains of burnt bones, ashes, and grave goods, suggesting that the cremation of the corpse took place inside of the grave (*ustrinum*).

Figure 9: Tomb 47, from east.

Figure 10: Tomb 59, from north.

5.1.3 Tile Graves

The two cases of tile graves attested are quite atypical. Tomb 20 consists of a shallow irregular pit of 0.60 m × 0.70 m covered by a portion of a large tile, where just the skulls and few long bones were found together with some grave goods, suggesting a secondary burial. Tomb 63 is the only clearly recognizable infant burial in the cemetery (Figure 11). A skeleton of 0.45 m of length of a 2–3-year-old child was laid supine between two shingles so as to create a sort of terracotta sarcophagus that also contained a guttus and an olpe, placed in a nearby pit. It could be noteworthy that both of these tombs are located in Group II in proximity to a cluster of cremation burials.

Figure 11: Tomb 63 before and after the removal of the shingle.

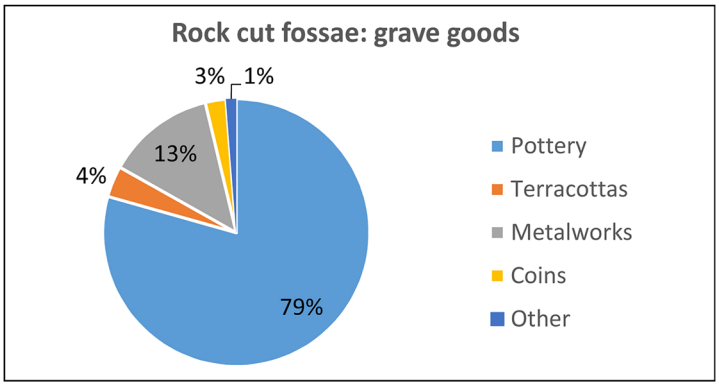

Figure 12: Pie chart related to the percentile presence of the main grave goods types in the rock-cut fossae.

5.2 Grave Goods and Funerary Assemblages: The Rock-Cut Fossae

Of the 135 tombs of the cemetery, 83 produced grave goods, of which 66 were fossae, 15 were cremation burials, and 2 were tile graves. Leaving apart the funerary assemblages of cremation burials and tile graves and focusing on the more significant evidence coming from the fossae, it is possible to discuss some preliminary data about the occurrence of grave goods and associations between items.

The majority of grave goods in the fossae are pottery (Figure 12) with a remarkable presence of lekythoi and skyphoi, followed by less attested shapes such as the kylix, olpe, guttus, pixis with lid, askos, aryballos, lamp, lekane, oinochoe, and stamnos, typical of the Archaic repertoire (Figure 13). Many comparisons of this assemblage can be made with the funerary assemblages of the Viala Santa Panagia cemetery (Guzzardi, 1993–1994). A *unicum* in the of the shape is the black slipped boar-shaped askos from tomb 3, which recalls similar lower quality examples from other Sicilian Greek cities (Magro, 2014).

In terms of the frequency of each shape and association between them, it is clear that there is a prevalence of lekythoi occurring as either a single grave good or combined with another lekythos or with a skyphos, the second most common shape in the funerary assemblages. Some lekythoi of higher quality, such as examples from tombs 22, 36, 86, 107, 119, 122, and 130, find stylistic parallels in the Santa Panagia necropolis (Guzzardi, 2003, p. 43) and at Gela and they can be attributed to the production of the Haimon group (Panvini, 2003) (Figure 14) and consequently offer a chronological timeframe for the use of the Scala Greca cemetery between the end of the sixth and the beginning of the fifth century BCE. Noteworthy and definitely of a higher quality is also the skyphos no. 72 from t. 107 with a scene of an aulos player and a dancing hoplite (Figure 15).

Several tombs have also yielded various types of terracotta figurines, including those of standing women with braids or a high polos, and rough, undifferentiated figurines with clasped hands over the chest. Additionally, figurines of animals, mainly horses and birds, have been found. A particularly noteworthy find is the partially preserved figurine of a knight on horseback, discovered in tomb 120, which is similar to other pieces found in a tomb at the Viale Santa Panagia necropolis (Guzzardi, 2003, p. 42) and in tomb 122 of the Ex Giardino Spagna necropolis (Orsi, 1925).

Regarding the evidence of metalwork, it is rather unimpressive (as shown in Figure 16). Bronze sewing needles, which are also frequently found in the Viale Santa Panagia necropolis, are quite common (Guzzardi, 2003, p. 42).

It is challenging to classify these items as pertaining to either male or female burials without anthropological analyses. Nonetheless, previous investigations have indicated a link between these needles and female interments (Pelagatti & Voza, 1979, p. 379). It is possible to infer that such needles could have been used to sew and repair fishing nets (Figure 17), though it is difficult to say with any certainty without proper comparative data.

The most noteworthy metal artifact discovered in the cemetery is an iron sword retrieved from tomb 70 (Figures 18 and 19). The sword is a short one, measuring 0.45 m in length, featuring an iron hilt and

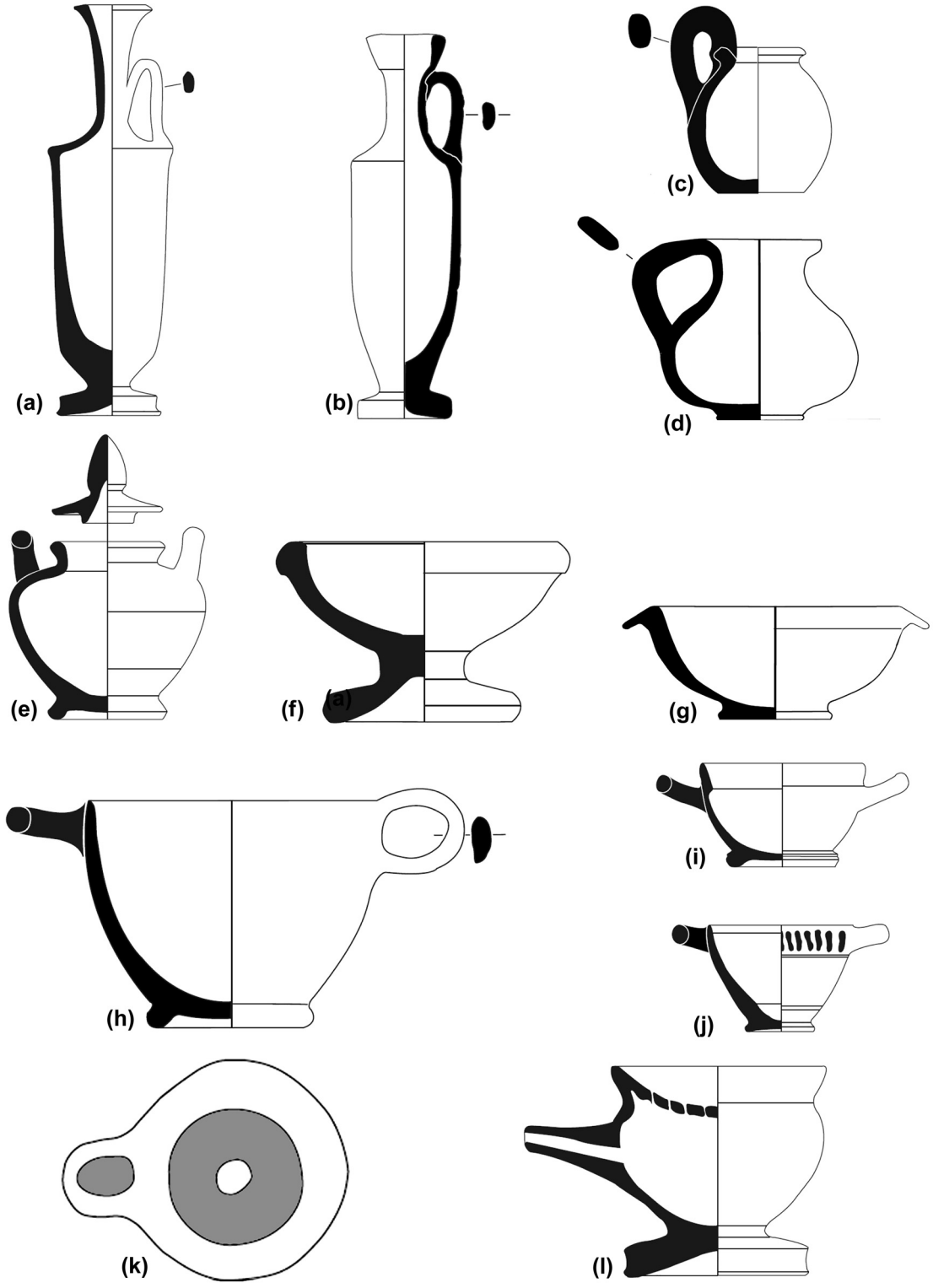

Figure 13: Overview of the principal ceramic shapes attested in the fossae: (a) tomb 122, no. 72; (b) tomb 116, no. 67; (c) tomb 20, no. 28; (d) tomb 34, no. 68; (e) tomb 86, no. 28; (f) tomb 86, no. 26; (g) tokb 37, no. 37; (h) tomb 95, no. 43; (i) tomb 95, no. 43; (j) tomb 117, no. 65; (k) tomb 76, no. 36bis; (l) tomb 63, no. 94, scale 1:3 (Tanasi et al., 2017a).

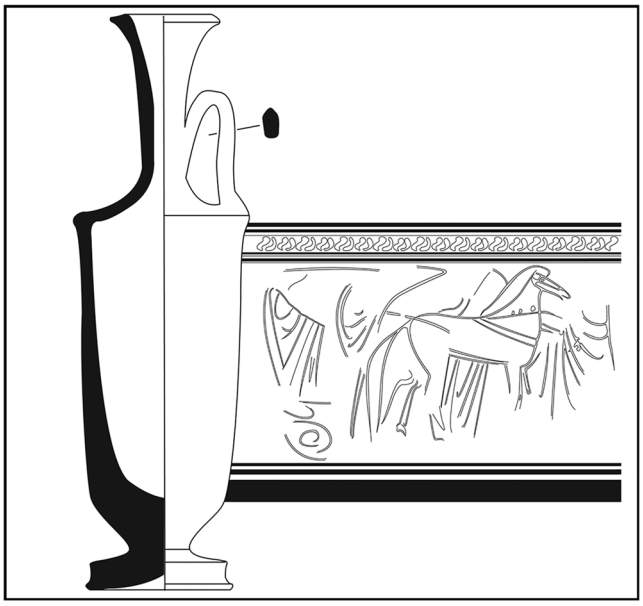

Figure 14: Tomb 122, Lekythos #72 with a scene of a funeral procession, (drawing R. Loveszy).

Figure 15: Skyphos #72 from rock-cut fossa 107 with a scene of an aulos player and a dancing hoplite (drawing R. Loveszy).

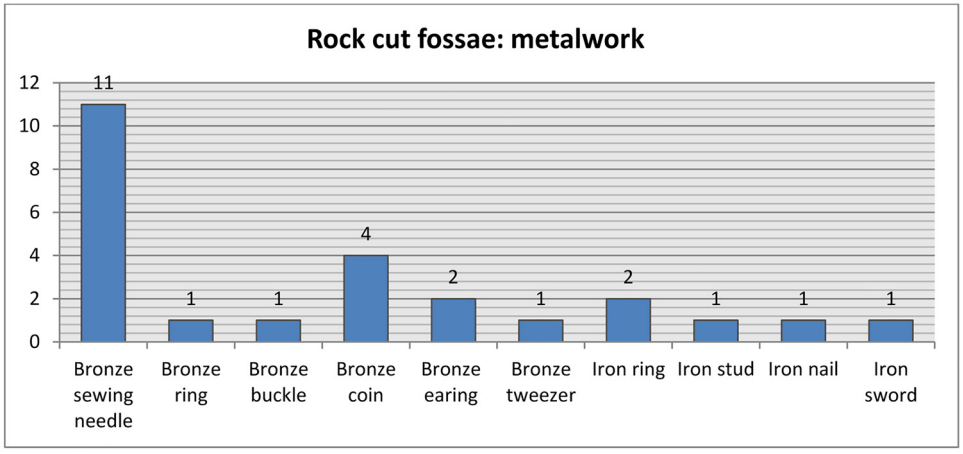

Figure 16: Chart indicating the presence of metal objects in the rock-cut fossae.

Figure 17: Bronze needles from tombs 27. 40, 44bis, 54, 105, 116, 129, and 134.

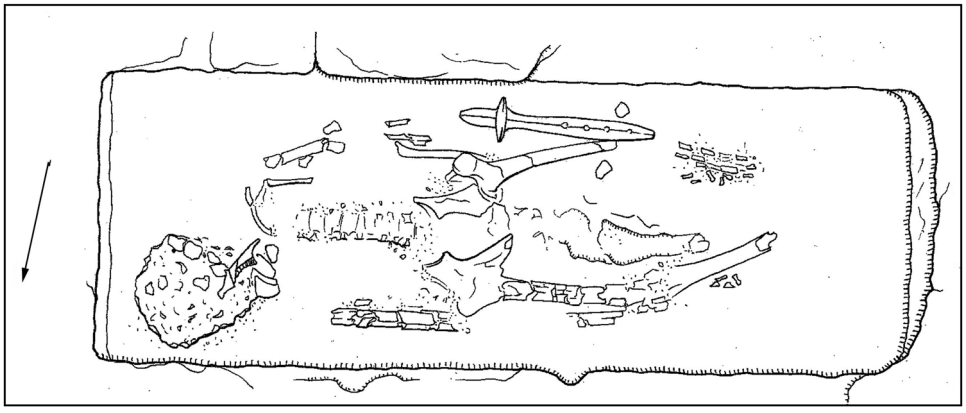

Figure 18: Plan of tomb 70 (Tanasi et al., 2017a).

accompanied by two large iron rings, which might have been utilized to attach it to a belt instead of a scabbard. The sword was placed next to the left side of the skeleton, being the sole object within the tomb, potentially serving as a marker of status for the deceased. The unearthing of weapons within the Archaic cemeteries of Syracuse is a rather infrequent discovery (Pelagatti & Voza, 1979). The preliminary report of the Viale Santa Panagia cemetery generally alludes to weapons in tombs 87, 98, 136, 152, and 251, but it does not specify the particular type of weapons (Guzzardi, 2003, p. 41).

In addition to the pottery, terracotta, and metalwork, it is noteworthy to mention the discovery of two alabaster alabastra in tombs 1 and 14, respectively. These perfume containers are sometimes associated with

Figure 19: Tomb 70, iron sword and two iron rings (Tanasi et al., 2017a).

infant burials (Lambrugo, 2005) and are believed to be imported due to the lack of active alabastron caves in Greek Sicily. In tomb 1, the alabastron was found placed upside down near the right shoulder of the skeleton and was accompanied by a bronze buckle, which may have been part of a belt. In tomb 14, the alabastron was placed upright by the left shoulder of the deceased and was found with a lekythos that was placed on the chest of the skeleton.

5.3 Spatial Organization

The presence of structures and features put in place by the living relatives of the dead as well as of a spatial organization in plots of this large cemeterial area already emerged from the evidence of Viale Santa Panagia necropolis. Here a series of deep grooves carved in the bedrock and arranged with circular holes in a specific design was interpreted as the platform of a catafalque to exhibit corpses or as the foundation of a funeral pyre related with tomb 40 and a massive stone slab found on the ground level at the center of tombs 6, 6bis, 6tris, 9, 19, and 64 was described as a broken altar (Guzzardi, 2003). Furthermore, a long cart track identified on the eastern side of the cemetery, on the roadway of current Viale Scala Greca, appeared to separate the cemetery in two large plots (Guzzardi, 2003).

At Viala Scala Greca cemetery, the establishment of the quarry which destroyed the central part of the cemetery and the alterations that occurred through the centuries in the area makes it quite difficult to infer anything about how the cemetery was organized above ground. However, some new data can be provided. The excavation of tomb 52, in Group II, pointed to the presence of a cobbled layer which was cut by the tomb. Considering that the excavation of the entire cemetery did not provide any material evidence prior to the Archaic period, it is reasonable to think that this cobbled area, possibly a sort of ceremonial space, was related to an initial phase of use of this area as a cemetery and then obliterated by the cutting of further tombs.

Furthermore, during the excavation of tomb 7, several fragments of a large calyx krater were found over the stone slabs covering the intact tomb, suggesting that it could have been used as a grave marker. Along the eastern limit of Group II, by a tomb nearly completely dug out by the quarry, a fragmentary spouted basin was collected. This shape, usually used to grind olives or grapes is not commonly found inside of graves, as it is generally associated with domestic contexts. Its discovery in a cemeterial area can be explained by it being used for ritual purpose and probably left above ground by a tomb in order to be periodically used by the relatives of the dead. In the same area three fragments of terracotta *pinakes* were also found, depicting parts of draped figures and animals.

5.4 Distribution of Grave Goods and Social Value

Apart from the graves lacking grave gifts, the assemblages of tombs 90 (8 items), 126 (9 items), and particularly 86 (10 items) suggest a higher social status for these three individuals, given that the majority of tombs produced between one and two grave goods. However, the small size of the tombs (126: 112 × 50 cm, 90: 97 × 38 cm; 86: 96 × 41 cm) implies that they were likely used for inter juvenile individuals who died prematurely, as seen in other cases (Pelagatti & Voza, 1979, pp. 374–375). The two alabastra, on the other hand, may demonstrate the ability of the deceased or their kin to obtain “exotic” objects, which may be expensive due to their materials. This ability could be linked to their wealth, work, or the identity they wished to assume, and rare objects could be a suitable synthesis of their life experiences. (Whitley, 2002). Here “exotic” refers to rare and uncommon objects and can be a simple measure of the possible “wealthy” status of a burial. It is important to note that there is no implied correlation between deposed artifacts and wealth or social status for such a limited study and small sample. Similarly, the assumptions made regarding the activities carried out by the buried individuals are educated guesses, serving to demonstrate a significant variability among those

buried in the same cemetery. The sword is also insufficient to determine the gender or occupation of the deceased, but it is a valuable and unusual grave good. Conversely, the 27 pit graves, with well-preserved skeletons but lacking any sort of grave goods, scattered in groups I, III, and IV of the cemetery, lead us to believe that these individuals had a low social status.

6 Exploring Social Identity Through Stable Isotope Analysis

6.1 Materials and Methods

In order to find indirect support for the evidence of a social hierarchy in the community buried in the cemetery of Viale Scala Greca, a large scale of archaeometric analysis meant to define the diet and culinary customs of the dead has been carried out. A sample of 15 individuals was chosen to represent tombs categorized as wealthy, average, and poor, based on the number of items in the funerary assemblage and the architectural features (Table 1). The classification was made by considering tombs with no funerary assemblage or only one grave gift, as well as irregular shape and no characterizing architectural features as "poor." Tombs with two or more objects or at least one "exotic" object, such as the iron sword, and with characterizing architectural features were interpreted as "wealthy." No specific correlation was found between the dimensions, architectural features, and number of objects. Specifically, individuals from tombs 28, 40, 42, 44bis, 49, 52, 54, 57, 69, 70, 78, 95, 98, 99, and 107 were selected for carbon, nitrogen, and oxygen isotope analyses to investigate the hypothesis that "wealthy" individuals would have had access to a protein-rich and varied diet compared to others. The premise is to compare the findings with the evidence found at Apollonia, a Greek city on the Black Sea, where despite differences in tomb types and grave goods assemblage, social status does not seem to have played a role in diet as far as the isotopic research testifies (Keenleyside et al., 2006, p. 1212).

The results obtained with the case study of the Viale Scala Greca necropolis, preliminarily presented elsewhere[7], are now contextualized with new bio-archaeological data[8] and compared and contrasted with the evidence offered by the written, iconographic, and archaeological sources.

At the storage of the Soprintendenza ai Beni Culturali e Ambientali di Siracusa, samples from long bones, such as femurs and tibias were extracted from all the 15 individuals to study carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) isotopes from collagen and apatite, while three molars (M1, M2, and M3) were also taken from the individual in tomb 107, to focus on carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotopes from collagen and enamel. The preparation of samples and the analyses were carried out in the Laboratory for Archaeological Science in the Department of Anthropology, University of South Florida.

Despite the great deal of care taken in the sampling process, only 13 samples out of 15 yielded valid results. The lack of collagen in samples from tombs 28 and 54 can be attributed to the acidity of the soil, which is quite high and partially explains the poor state of preservation of the grave goods and skeletal remains. No comparative faunal remains have been analyzed, which limited the conclusions on specific dietary habits.

6.2 Results and Discussion

There appears to be a correlation between the state of preservation of the bones, the absence of grave goods, and a predominantly vegetarian diet. Specifically, the bone apatite carbon isotope values indicate a diet based purely on C3 plants (Table 2) (Harrison and Katzenberg 2003; Jim, Ambrose, & Evershed, 2004; Lee-Thorp, Sealy, & Van Der Merwe, 1989; Schwarcz, Ambrose, & Katzenberg, 2000). According to controlled animal

7 Tanasi et al. 2016.

8 The bio-archaeological study has been conducted by Dr Roberto Miccichè (University of Palermo & University of Augsburg).

Table 2: Stable isotope data for bone collagen and bone apatite

Tomb	Tissue	$\delta^{13}C$	$\delta^{15}N$	C:N	USF # ap	$\delta^{13}C$	$\delta^{18}O$
28	Bone (femur)	No collagen yield			27810	−13.9	−2.5
40	Bone (femur)	−19.3	11.6	3.2	27811	−11.7	−2.9
42	Bone (femur)	−19.5	10.1	3.3	27812	−11.1	−3.4
44bis	Bone (femur)	−19.5	9.7	3.3	27813	−10.3	−3.1
49	Bone (femur)	−19.7	9.1	3.3	27814	−10.9	−3.2
52	Bone (femur)	−20.1	8.9	3.3	27815	−10.9	−3.1
54	Bone (femur)	No collagen yield			27816	−11.2	−2.7
57	Bone (femur)	−19.3	10.8	3.4	27817	−11.2	−3.5
69	Bone (femur)	−19.0	11.8	3.3	27818	−11.7	−2.7
70	Bone (femur)	−19.6	9.9	3.4	27819	−11.6	−2.3
78	Bone (femur)	−19.2	10.5	3.4	27820	−11.3	−3.0
95	Bone (femur)	−18.6	11.5	3.3	27821	−10.6	−2.9
98	Bone (femur)	−19.0	10.7	3.4	27822	−10.9	−3.4
99	Bone (femur)	−19.3	11.5	3.4	27823	−11.6	−2.9
107	Bone (femur)	−19.5	11.6	3.3	27824	−10.8	−2.9

Note: Oxygen data were also obtained and are included for reference only; they are not sufficient for a discussion of mobility and not relevant for the present discussion on diet but could be useful to integrate in future studies.

feeding experiments, the current consensus is that the ^{13}C content found in bone apatite reflects that of the entire diet, including proteins, carbohydrates, and lipids. This agreement is supported by the most important studies in the field conducted by Ambrose et al. 1993, Jim et al. (2004), Tieszen, Fagre, Lambert, and Grupe (1993), and Schwarcz et al. (2000), where linear 1:1 correlation of the whole diet and apatite ^{13}C values were observed in rats and mice, respectively. The apatite carbonate, which is derived from blood bicarbonate, ultimately samples the total metabolic carbon pool, and thus, the diet. As a result, if blood bicarbonate is in isotopic equilibrium with apatite carbonate, the ^{13}C value of bone apatite will reflect that of the diet. In the metabolic steady state, nearly all ingested carbon atoms (>99%) exit the body as respired CO_2 from the lungs. Consequently, respired CO_2 comprises the carbon from all dietary macronutrients according to their proportions in the diet and is in isotopic equilibrium with blood bicarbonate. Furthermore, the ^{13}C values of respired CO_2 from the study determined by Tieszen et al. (1993) were shown to correlate linearly with both whole diet and apatite ^{13}C values, further supporting the model. In our study, in general, the carbon isotope differences between bone collagen and apatite are consistent, with a median difference of −8.1‰, which exceeds the difference anticipated for consumers of terrestrial foods that are based on C3 plants. This large difference indicates the direct consumption of plant-based foods that have a more positive carbon isotope value than the plants that are more commonly consumed as dietary protein sources, such as animal meat and its byproducts. These plant-based foods could be from a C4 plant, such as millet, and/or a marine plant, such as seaweed, both of which have low nitrogen isotope values (Blanz et al., 2019; Schulting, Vaiglova, Crozier, & Reimer, 2017). Based on historical evidence, it is apparent that seaweed has been commonly used as a fertilizer along coastal Europe for the past few centuries. This practice has led to yield increases comparable to those resulting from fertilization with animal manure, as documented by Hendrick in 1898. Since the availability of animal manure and draft animals have been identified as key limiting factors for fertilization practices in Neolithic Europe, as suggested by Bogaard (2012) and Gron et al. (2017), it is plausible or even probable that the use of seaweed as a fertilizer has been implemented since the Neolithic period. This hypothesis is further supported by studies conducted by Milner, Craig, Bailey, Pedersen, and Andersen (2004) and Schulting, Sebire, and Robb (2010), which indicate that seaweed was widely available along the coastline. Otherwise, as a precautionary principle, in our study, the possible and undocumented soil contamination is well below the percentage variance margins reported in the reference studies (in the case of $\delta^{15}N$ 0.4–0.6‰ ± 1σ)[9].

9 Ambrose et al. 1993.

Table 3: Stable isotope data for tooth enamel

Tomb/tooth	$\delta^{13}C$	$\delta^{18}O$
107 M1	−13.1	−3.5
107 M2	−11.0	−2.5
107 M3	−12.4	−3.8

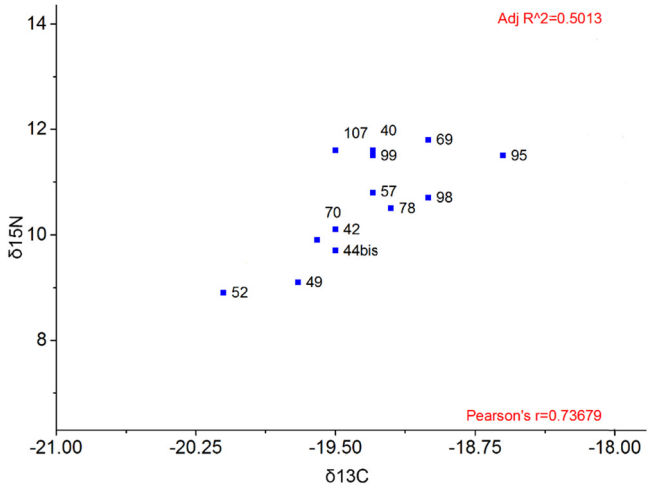

Figure 20: Plot of bone collagen isotopes $\delta^{13}C$ and $\delta^{15}N$ with generic indicators of C3 plants, terrestrial animals, and marine food.

The carbon isotope variances between bone collagen and apatite display a consistent pattern with a median difference of −8.1‰, which is greater than the expected difference for terrestrial food consumers relying on C3 plants. This indicates that direct plant food consumption with a positive carbon isotope value, possibly from a C4 plant like millet or a marine plant such as seaweed with low nitrogen isotope values, was common among the studied population. Nevertheless, there are larger variances observed in individuals from tombs 44bis and 52 (−9.2‰) who had a larger intake of plants and few or no grave goods, indicating a more diverse diet than suggested by collagen alone, yet still deficient in animal proteins. The individual from tomb 49 (−8.8‰) can be added to this group. In contrast, the individual from tomb 69 had relatively more negative values in apatite than in collagen, with a difference of −7.3‰, distinguishing it from those from tombs 95 and 98, which formed the group with the most varied diet, probably based on consumption of some marine food. Oxygen data were collected but are not sufficient to discuss mobility and are not relevant for the present discussion on diet, but they could be useful for future studies.

The data from the individual in tomb 107 (Table 3) indicates a limited range of food intake during childhood and a probable change in geographic location from childhood to adulthood (Buzon & Bowen, 2010; Humphrey, Dean, Jeffries, & Penn, 2008; Wright & Schwarcz, 1998). However, due to the limited nature of the data, this cannot be definitively confirmed. Nevertheless, the possibility of differences in diet between children and adults in ancient Greek Syracuse cannot be ruled out.

Based on the $\delta^{15}N$ values, there is no indication of fish consumption among the sampled individuals, even without local fish analyses. The values are too low and suggest a similarity in diet with individuals from the Greek world of various time periods, who did not regularly eat fish (Papathanasiou, Richards, Fox, & 2015; Papathanasiou, 2015; Triantaphyllou, 2015).

The only exception may be the individual from tomb 95, who may have consumed fish more frequently. Overall, the range of values indicates a significant variability in diet, ruling out the possibility that fish was a staple food for the 13 individuals sampled from the Viale Scala Greca necropolis (Figure 20).

7 Conclusion

The isotopic analysis conducted on the individuals has resulted in a preliminary dataset of individuals with varying diets, ranging from poor to rich in animal proteins. Although the sample size is limited, the study conducted on the individuals from Syracuse reveals a basic diet primarily composed of C3 plants, with some individuals also consuming plants such as millet and/or seaweed and varying amounts of animal proteins. None of the samples analyzed indicated malnourishment, despite the absence of grave goods in some burials which might have indicated a lack of resources. Our findings are consistent with the results of the isotopic study conducted at Himera. Our classification of "wealthy" and "poor" individuals, which was used as a rough suggestion, has proved useful in identifying potential differences in diet based on social status. This study supports the hypothesis that social stratification may have had an impact on the diet of individuals during the Archaic period, even though a single cemetery was used for all individuals and differences in grave size and grave goods did not provide conclusive evidence of social status and hierarchy.

The results of our pilot study, however, further highlight the critical discrepancy between the massive reference to fish/fishing/fish consumption in the literary and iconographic sources and the isotopic evidence, especially with respect to Syracuse, which appears to have had such an important role in Greek gastronomy. How can this discrepancy be tackled? Did Greeks of Sicily have "a bigger fish to fry" in the Archaic period that made them limit the procurement and consumption of fish? Some general arguments can be discussed to attempt to explain the limited consumption of fish among the Greeks such as economic convenience of fishing, affordability of fish, religious prohibition, moral restrain, and personal preferences.

Fishing was definitely a hard, time consuming, and at times expensive activity with unpredictable economic outcomes in comparison to the more stable profits offered by farming or husbandry (Wilkins, 2018). Fishermen are often described in the written sources as poor individuals struggling to thrive, although the product they harvested from the sea was highly regarded by the elites[10], a fact informing us about the important role that fishmongers must have played in the Greek society.

An indication of the affordability of fish is given by the extraordinary discovery of an inscription dated to 200 BCE ca. period at Akraiphia in Boetia showing a fish price list organized per size and including marine and fresh water fish, with prices per single fish, per portions of a fish, and per units. Such a public document was meant as a market regulation establishing the maximum price fixed by the fishmongers for every class of fish (Forsyth, 2015). Pending the interpretative problems for the names of some fish and their actual monetary value, it appears that marine fish were more expensive than fresh water ones and that the larger the fish the higher was the prize, with tuna being at the top of the list and some fish on the list definitely very affordable (Mylona, 2009). Although a leitmotiv in the Greek Comedy, for those specifically or incidentally dealing with fish, are complaints about the high price of fish or fish dishes (Garcia Soler, 2010). It is important to remember that comedy was a hyperbolic rendering of reality.

A hypothetical explanation for fish abstention could be connected with certain religious practices (Beer, 2010). Fish appears to be a taboo for the initiates to the Eleusian Mysteries and certain acolytes of the cult of Demeter and Cybele. Pythagoreans as well seemed to abstain partly or fully from eating fish. But the nature of such prohibitions being mostly temporary and related with a status accessible to a limited number of individuals, it cannot be used as a valid argument to justify the apparent isotopic absence of fish from the Greek diet.

Philosophically speaking, abstaining from eating luxurious food, such as fish, could also be considered as a virtuous exercise of self-control to resist appetite and desire which ultimately could have costed moral integrity and put passions and strong pleasures over rationality (Wilkins, 2000). But this argument does not really apply to Syracusans, who were notorious lovers of luxurious banquet and followers of a refined cuisine.

Ultimately, preference for fish was certainly a personal decision which may have been conditioned by the peculiar taste and texture of the fish flesh, which vary a lot from species to species, as it happens nowadays. However, none of those arguments taken individually explain the evidence emerging from the isotopic studies

10 Theocritus, *Idyll* XXI,6.

carried out at Himera and Syracuse and all together do not really match with the cultural climate of Archaic Sicily.

A possible explanation can be offered just taking into consideration the chronological dimension. On the basis of the literary evidence and iconographic evidence, the fourth century BCE appears to be the golden age for fish consumption in Sicily and as a reflection also in Athens, as it seems from the New Comedy. The popularity of Archestratus work, the production and circulation of fish-plates are definitely the strongest indicators of this new culinary milieu which developed between Classical and Hellenistic period in Sicily. On the other hand, the lack of references for the Archaic period could be explained by assuming that the diet was mostly centered on consumption of cereals, supplemented by animal proteins and just occasionally by fish, and that no particular cultural value was yet assigned to the fish. This approach could address the negative results in terms of fish consumption emerging from the case studies of Himera and Syracuse. This study has to be considered a pilot study, and the sample could be expanded to statistically confirm our conclusion in future research.

Author contributions: D.T.: conceptualization; D.T. and E.G.: methodology; E.G.: validation; D.T. and E.G.: investigation; D.T. and E.G.: formal analysis; D.T.: resources; D.T.: project administration; D.T.: supervision and funding acquisition; D.T. and E.G.: writing – original draft; D.T. and E.G.: writing – review and editing. All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

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References

Agnello, G. (1949a). no. 1843, *Fasti Archaeologici*, 47.

Agnello, G. (1949b). no. 2363, *Fasti Archaeologici*, 75.

Ambrose, S. H., Norr, L. (1993). Experimental Evidence for the Relationship of the Carbon Isotope Ratios of Whole Diet and Dietary Protein to Those of Bone Collagen and Carbonate. In Lambert J. B., Grupe G. (Eds.), *Prehistoric Human Bone* Archaeology at the Molecular Level, Springer-Verlag (pp. 1–37). Heidelberg, Berlin: Springer-Verlag.

Basile, B. (1992). Modellini fittili di imbarcazioni dalla Sicilia Orientale. In Gianfrotta P. A. (Ed.), *Atti V Rassegna di Archeologia subacquea, Giardini Naxos 19–21 Ottobre 1990* (pp. 11–50). Giardini Naxos: Edizioni P&M Associati.

Basile, B. (1993–1994). Indagini nell'ambito delle necropoli siracusane. *Kokalos*, XXXIX – XL, 1315–1342.

Beer, M. (2010). *Taste or taboo: Dietary choices in antiquity*. Trowbridge: Cromwell Press Group.

Blanz, M., Ascough, P., Mainland, I., Martin, P., Taggart, M. A., Dieterich, B., … Feldmann, J. (2019). Seaweed fertilisation impacts the chemical and isotopic composition of barley: Implications for analyses of archaeological skeletal remains. *Journal of Archaeological Science*, *104*(1), 34–44.

Bogaard, A. (2012). Middening and manuring in Neolithic Europe: Issues of plausibility, intensity and archaeological method. In *Manure matters: Historical, archaeological and ethnographic perspectives* (pp. 25–39). London: Routledge.

Bonacasa, N., & Joly, E. (1985). L'Ellenismo e la tradizione ellenistica. In Garzanti (Ed.), *Sikanie: Storia e civiltà della Sicilia greca* (pp. 277–358). Milano: Garzanti.

Botte, E. (2018). Fish processing in Italy and Sicily during Antiquity. *Journal of Maritime Archaeology*, *12*(3), 377–397.

Buzon, M. R., & Bowen, G. J. (2010). Oxygen and carbon isotope analysis of human tooth enamel from the New Kingdom site of Tombos in Nubia. *Archaeometry*, *52*(5), 855–868.

Carboni, R. (2016). Unusual sacrificial victims: Fish and their value in the context of sacrifices. In P. A. Johnston, A. Mastrocinque, & S. Papaioannou (Eds.), *Animals in Greek and Roman Religion and Myth* (pp. 255–279). Newcastle upon Tyne: Cambridge Scholars Publishing.

Chilardi, S. (2006). Artemis Pit? Dog Remains from a Well in the Ancient Town of Siracusa (Sicily). In L. M. Snyder & E. A. Moore (Eds.), *Dogs and people in social, working, economic or symbolic interaction* (pp. 32–37). Oxford: Oxbow Books.

Cultrera, G. (1943). Siracusa – Scoperta nel giardino Spagna. *Notizie degli Scavi di Antichità*, 33–332.

Ekroth, G. (2017). Bare Bones: Zooarchaeology and Greek Sacrifice. In S. Hitch & I. Rutherford (Eds.), *Animal sacrifice in the ancient Greek world* (pp. 15–47). Cambridge: Cambridge University Press.

Felici, E. (2012). Un impianto con thynnoskopeion per la pesca e la salagione sulla costa meridionale della Sicilia (Pachino, SR). *Eliano, Oppiano e la Tonnara Antica, Tradizione, Tecnologia e Territorio*, *2*, 11–44.

Garcia Soler, M. J. (2010). Gastronomia e pubblicità nella Grecia antica. In F. De Martino (Ed.), *Antichità e Pubblicità* (pp. 345–366). Bari: Levante.

Gentili, G. V. (1951). Scoperte nelle due nuove arterie stradali, la Via di Circonvallazione, ora Viale P. Orsi, e la Via Archeologica, ora Viale F.S.Cavallari. *Notizie degli Scavi di Antichità*, 261–334.

Gentili, G. V. (1954). Ara di Ierone - Campagna di scavo 1950-1951. *Notizie degli Scavi di Antichità*, 333–383.

Gentili, G. V. (1961). (Contrada Palazzo) – Tombe greche tra la via per S. Panagia e il c.d."Muro di Gelone" in proprietà Gargallo. *Notizie degli Scavi di Antichità*, *15*, 405–418.

Germanà, G. (2011). Necropoli e società aristrocratica a Siracusa durante l'età arcaica. In V. Nizzo (Ed.), *Dalla nascita alla morte: Antropologia e archeologia a confronto Roma: E.S.S* (pp. 689–699).

Gianfrotta, P. (2005). Osservazioni sulla pesca del corallo rosso nell'antichità. *Archaeologia Maritima Mediterranea*, *2*, 179–190.

Greco, E., El-Aguizy, O., Ali, M. F., Foti, S., Cunsolo, V., Saletti, R., & Ciliberto, E. (2018). Proteomic analyses on an ancient Egyptian cheese and biomolecular evidence of brucellosis. *Analytical Chemistry*, *90*(16), 9673–9676.

Gron, K. J., Gröcke, D. R., Larsson, M., Sørensen, L., Larsson, L., Rowley-Conwy, P., … Church, M. J. (2017). Nitrogen isotope evidence for manuring of early neolithic Funnel beaker culture cereals from Stensborg, Sweden. *Journal of Archaeological Science: Reports*, *14*, 575–579.

Guzzardi, L. (1993–1994). Ricerche archeologiche nel Siracusano. *Kokalos*, XXXIX – XL, 1299–1314.

Guzzardi, L. (2003). Siracusa tra VI e V sec. A.C. La necropoli di Viale Santa Panagia. *Chronos*, *18–19*, 39–72.

Harrison, R. G., Katzenberg, M. A. (2003). Paleodiet studies using stable carbon isotopes from bone apatite and collagen: examples from Southern Ontario and San Nicolas Island, California. *Journal of Anthropological Archaeology*, 22(3), 227–244.

Henneberg, R., & Henneberg, M. (2003). The diet of the Metapontine population as reconstructed from the physical remains. In J. C. Carted (Ed.), *Living off the Chora: Diet and nutrition at Metaponto* (pp. 29–36). Austin: Institute of Classical Archaeology, University of Texas at Austin.

Humphrey, L. T., Dean, M. C., Jeffries, T. E., & Penn, M. (2008). Unlocking evidence of early diet from tooth enamel. *Proceedings of the National Academy of Sciences of the United States of America*, *105*(19), 6834–6839.

Forsyth, D. W. (2015). Epigraphic Fish Lists and Seafood Processing in Hellenistic Greece. In J. Found, M. Newbery, & A. Salaad (Eds.), *Sea lines of communication – Construction* (pp. 71–86). Southampton: University of Southampton.

Keenleyside, A., Schwarcz, H. P., & Panayotova, K. P. (2006). Stable isotopic evidence of diet in a Greek colonial population from the Black Sea. *Journal of Archaeological Science*, *33*(9), 1205–1215.

Jim, S., Ambrose, S. H., & Evershed, R. P. (2004). Stable carbon isotopic evidence for differences in the dietary origin of bone cholesterol, collagen and apatite: Implications for their use in palaeodietary reconstruction. *Geochimica et Cosmochimica Acta*, *68*(1), 61–72.

Killgrove, K., & Tykot, R. H. (2013). Food for Rome: A stable isotope investigation of diet in the Imperial period (1st–3rd Centuries AD). *Journal of Anthropological Archaeology*, *32*, 28–38.

Lagia, A. (2014). Health inequalities in the Classical city: A biocultural approach to socioeconomic differentials in the polis of Athens during the Classical, Hellenistic and Imperial Roman periods. In A. C. Gilles (Ed.), *L'apport de la paléoanthropologie funéraire aux sciences historiques. Corps, travail et statut social* (pp. 95–115). Villeneuve d'Ascq: Presses Universitaires du Septentrion: Archaiologia.

Lagia, A. (2015a). The potential and limitations of bioarchaeological investigations in classical contexts in Greece: An example from the polis of Athens. In D. C. Haggis & C. M. Antonaccio (Eds.), *Classical archaeology in context: Theory and practice in excavation in the Greek world* (pp. 149–173). New York: Walter de Gruyter.

Lagia, A. (2015b). Diet and the polis: An isotopic study of diet in Athens and Laurion during the classical, Hellenistic and imperial Roman periods. In A. Papathanasiou, M. P. Richards, & S. C. Fox (Eds.), *Archaeodiet in the Greek world: Dietary Reconstruction from Stable isotope analysis (Hesperia Sup.)* (Vol. 49, pp. 119–145).

Lagia, A., Papathanasiou, A., & Triantaphyllou, S. (2014). The state of approaches to archaeological human remains in Greece. In B. O'. Donnabhain & M. C. Lozada (Eds.), *Archaeological human remains* (pp. 105–126). New York: Springer.

Lambrugo, C. (2005). Per la storia di un mondo "minore". Alabastra e aryballoi corinzi nella necropoli arcaica di Gela: Esegesi di un indicatore infantile. *Orizzonti*, *VI*, 81–93.

Lanza, M. T. (1989). Burying the dead: The Syracusan necropoleis. In B. Daix Westcoat (Ed.), *Syracuse, The fairest Greek city* (pp. 111–112). Roma: De Luca.

Lee-Thorp, J. A., Sealy, J. C., & Van Der Merwe, N. J. (1989). Stable carbon isotope ratio differences between bone collagen and bone apatite, and their relationship to diet. *Journal of archaeological science*, *16*(6), 585–599.

Leighton, R. (1986). Paolo Orsi (1859-1935) and the prehistory of Sicily. *Antiquity*, *60*, 15–20.

Lena, G., Basile, B., & Di Stefano, G. (1988). Approdi, porti, insediamenti costieri e linee di costa nella Sicilia sud-orientale. *Dalla preistoria alla Tarda Antichità, Archivio Storico Siracusano*, *3*(2), 5–87.

Magro, M. T. (2014). Considerazioni sui vasi plastici siciliani presenti nella collezione Vagliasindi di Randazzo. *Les Carnets de l'Association for Coroplastic Studies*, *11*, 2–8.

Marconi, C. (2007). *Temple decoration ad cultural identity in the archaic Greek World: The metopes of Selinus*. Cambridge: Cambridge University Press.

McPhee, I., & Trendall, A. D. (1987). *Greek red-figured fish-plates*. Vereinigung der Freunde antiker Kunst.

McPhee, I., & Trendall, A. D. (1990). Addenda to Greek red-figured fish-plates. *Antike Kunst*, *33*(1), 31–52.

Milner, N., Craig, O. E., Bailey, G. N., Pedersen, K., & Andersen, S. H. (2004). Something fishy in the Neolithic? A re-evaluation of stable isotope analysis of Mesolithic and Neolithic coastal populations. *Antiquity, 78*(299), 9–22.

Mollo, F. (2007). Tra Sicilia e Campania. Osservazioni sui contesti di provenienza e sull'iconografia dei piatti da pesce del basso Tirreno. *Sicilia Antiqua*, *4*, 65–86.

Montanari, O. (1999). I pesci di pregio nella Vita di Delizie di Archestrato di Gela. *Les Mélanges de l'École française de Rome*, *111*(1), 67–77.

Mylona, D. (2009). Edible fish categories beyond the Linnaean taxonomy. In A. Matalas & N. Xirotiris (Eds.), *Fish and seafood: Anthropological perspectives from the past and the present, 28th ICAF Proceedings, Kamilari 2009* (pp. 55–74).

Mylona, D., Ntinou, M., Pakkanen, P., Pentinnen, A., Serjeantson, D., & Theodoropoulou, T. (2013). Integrating archaeology and science in a Greek Sanctuary. In S. Voutsaki & S. M. Valamoti (Eds.), *Diet, economy and society in the ancient Greek World* (pp. 187–204). Leueve: Peeters.

Orsi, P. (1894). Relazione sugli scavi eseguiti nella necropoli del Fusco. *Notizie degli Scavi di Antichità,* 2–44.

Orsi, P. (1895). Gli scavi della necropoli del Fusco a Siracusa. *Notizie degli Scavi di Antichità*, 2–86.

Orsi, P. (1897). Di alcune necropoli secondarie di Siracusa. *Notizie degli Scavi di Antichità*, 471–504.

Orsi, P. (1915). Siracusa. *Notizie degli Scavi di Antichità*, 122–208.

Orsi, P. (1925). Nuova necropoli greca dei sec. VII-VII". *Notizie degli Scavi di Antichità*, 176–321.

Papathanasiou, A. (2015). Stable isotope analyses in Neolithic and Bronze Age Greece: An overview. *Hesperia Supplements*, *49*(1), 25–55.

Papathanasiou, A., Richards, M. P., & Fox, S. C. (2015). Archaeodiet in the Greek world. Athens: American School of Classical Studies at Athens.

Panvini, R. (2003). Le ceramiche attiche dall'emporio arcaico di Gela". In F. Giudice & R. Panvini (Eds.), *Ta attika: Veder greco a Gela; Ceramiche attiche figurate dall'antica colonia* (pp. 215–227). Roma: L'Erma di Bretschneider.

Pelagatti, P., & Voza, G. (1979). Le necropoli. In *A.A.V.V., Storia della Sicilia* (pp. 357–388). Napoli: Società editrice storia di Napoli e della Sicilia.

Purpura, G. (1982). Pesca e stabilimenti antichi per la lavorazione del pesce in Sicilia.I - S.Vito (Trapani), Cala Minnola (Levanzo). *Sicilia Archeologica*, *48*, 45–60.

Purpura, G. (1985). Pesca e stabilimenti antichi per la lavorazione del pesce in Sicilia.II - Isola delle Femmine (Palermo), Punta Molinazzo (Punta Rais), Tonnara del Cofano (Trapani), San Nicola (Favignana). *Sicilia Archeologica*, *57–58*, 59–86.

Purpura, G. (1989). Pesca e stabilimenti antichi per la lavorazione del pesce in Sicilia. III - Torre Vendicari (Noto), Capo Ognina (Siracusa). *Sicilia Archeologica*, *69–70*, 25–37.

Purpura, G. (1992). Pesca e stabilimenti antichi per la lavorazione del pesce in Sicilia. *IV - Un bilancio, Atti V Rassegna di Archeologia subacquea, Giardini Naxos 19-21 Ottobre 1990* (pp. 87–101). Giardini Naxos: Azienda Autonoma di Soggiorno e Turismo.

Reitsema, L. J. (2013). Beyond diet reconstruction: Stable isotope applications to human physiology, health, and nutrition. *American Journal of Human Biology*, *25*, 445–456.

Reitsema, L. J., Britney K., & Vassallo S. (2020). Food traditions and colonial interactions in the ancient Mediterranean: Stable isotope evidence from the Greek Sicilian colony Himera. *Journal of Anthropological Archaeology*, *57*, 1–15.

Schoeninger, M. J. (2011). Diet reconstruction and ecology using stable isotope ratios. In C. S. Larsen (Ed.), *A companion to biological anthropology* (pp. 445–464). Chichester: Wiley-Blackwell.

Schulting, R. J., Vaiglova, P., Crozier, R., & Reimer, P. J. (2017). Further isotopic evidence for seaweed-eating sheep from Neolithic Orkney. *Journal of Archaeological Science: Reports*, *11*, 463–470.

Schulting, R. J., Sebire, H., & Robb, J. E. (2010). On the road to Paradis: New insights from AMS dates and stable isotopes at Le Déhus, Guernsey, and the Channel Islands middle Neolithic. *Oxford Journal of Archaeology*, *29*, 149–173.

Schwarcz, H. P., Ambrose, S. H., & Katzenberg, M. A. (Eds.). (2000). *Biogeochemical Approaches to Paleodietary Analysis* (pp. 189–209). New York: Kluwer Academic/Plenum.

Shepherd, G. (1995). The pride of most colonials: Burial and religion in the Sicilian colonies. *Acta Hyperboraea*, *6*, 51–82.

Shepherd, G. (2005). Dead men tell no tales: Ethnic diversity in Sicilian colonies and the evidence of the cemeteries. *Oxford Journal of Archaeology*, *24*(2), 115–136.

Shepherd, G. (2013). Ancient identities: Age, gender, and ethnicity in ancient Greek Burials. In L. Nilsson Stutz & S. Tarlow (Eds.), *The Oxford handbook of the archaeology of death and burial* (pp. 543–558). Oxford: Oxford University Press.

Tanasi D., Tykot, R. H., Vianello, A., & Hassam, S. (2017a). Stable isotope analysis of the dietary habits of a Greek community in Archaic Syracuse (Sicily): A pilot study. *STAR: Science & Technology of Archaeological Research*, *3*(1), 1–11.

Tanasi, D., Greco, E., Di Tullio, V., Capitani, D., Gullì, D., & Ciliberto, E. (2017b), 1H-1H NMR 2D-TOCSY, ATR FT-IR and SEM-EDX for the identification of organic residues on Sicilian prehistoric pottery. *Microchemical Journal*, *135*, 140–147.

Tanasi, D., Lanteri, R., & Hassam, S. (2016). New data on the funerary religion of the Greeks of Sicily: The Archaic Necropolis of Viale Scala Greca at Syracuse. In H. Reid & D. Tanasi (Eds.), *Philosopher kings and tragic heroes: Essays on the imaged and ideas from Western Greece* (pp. 329–352). Sioux City: Parnassos Press.

Tanasi, D., Greco, E., Ebna Noor, R., Feola, D., Kumar, V., Crispino, A., & Gelis, I. (2018). 1H NMR, 1H-1H 2D TOCSY and GC-MS analyses for the identification of olive oil on Early Bronze Age pottery from Castelluccio (Noto, Italy). *Analytical Methods 10*(2757), 1–8.

Tanasi, D., Greco, E., Pisciotta, F., & Hassam, S. (2021a). Chemical characterization of organic residues on Late Roman amphorae from shipwrecks off the coast of Marsala (Trapani, Italy). *Journal of Archaeological Science: Reports*, *40*, 1–7.

Tanasi, D., Cucina, A., Cunsolo, V., Saletti, R., Di Francesco, A., Greco, E., & Foti, S. (2021b), Paleoproteomic profiling of organic residues on prehistoric pottery from Malta. *Amino Acids*, *53*, 295–312.

Triantaphyllou, S. (2015), Stable isotope analysis of skeletal assemblages from prehistoric northern Greece. In A. Papathanasiou, M. P. Richards, & S. C. Fox (Eds.), *Archaeodiet in the Greek world: Dietary reconstruction from stable isotope analysis*, *American School of Classical Studies*, *Hesperia Supplement* (Vol. 49, pp. 57–75).

Tieszen, L. L., Fagre, T., Lambert, J. B., & Grupe, G. (1993). Bone chemistry and ancient diet. In C. Smith (Ed.), *Encyclopedia of global archaeology* (pp. 931–941). New York: Springer.

Trendall, A. D. (1983). *The Red-figured Vases: Lucania, Campania & Sicily (Bulletin Supplement No. 41)*. London: University of London, Institute of Classical Studies.

Tykot, R. H. (2014). Bone chemistry and ancient diet. In C. Smith (Ed.), *Encyclopedia of global archaeology* (pp. 931–941). New York: Springer.

Vika, E., Aravantinos, V., & Richards, M. P. (2009). Aristophanes and stable isotopes: A taste for freshwater fish in Classical Thebes (Greece)?. *Antiquity*, *83*(322), 1076–1083.

Voza, G. (1976–1977). L'attività della Soprintendenza alle antichità della Sicilia orientale. II. *Kokalos*, XXII–XXIII, 551–587.

Zoepfell, R. (1993). Le fonti scritte su Dionigi I di Siracusa. In La monetazione dell'età dionigiana. *Atti del VIII convegno del Centro Internazionale di Studi Numismatici, Napoli, 29 maggio - 1 giugno 1983 (Atti del convegno del Centro Internazionale di Studi Numismatici 8)* (pp. 39–56).

Whitley, J. (2002). Objects with attitude: Biographical facts and fallacies in the study of Late Bronze Age and Early Iron Age warrior graves. *Cambridge Archaeological Journal*, *12*(2), 217–232.

Wilkins, J. (2000). *The boastful chef: The discourse of food in ancient Greek Comedy*. Oxford: Oxford University Press.

Wilkins, J. (2018). Cooking and processing fish in antiquity: Questions of taste and texture. *Journal of Maritime Archaeology*, *13*(2), 225–234.

Wilkins, J., & Hill, S. (2011). *Archestratus: Fragments from the life of luxury*. Totnes: Prospect Books.

Wright, L. E., & Schwarcz, H. P. (1998). Stable carbon and oxygen isotopes in human tooth enamel: Identifying breastfeeding and weaning in prehistory. *American Journal of Physical Anthropology: The Official Publication of the American Association of Physical Anthropologists*, *106*(1), 1–18.