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Mirroring Mediterraneanization: Pottery production at Archaic Monte Iato, Western Sicily (6th to 5th century BCE)

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ABSTRACT

With a total of 162 samples, one of the most extensive NAA sample series from one single inland settlement in Archaic Sicily is now available to address long debated issues about the impact of the so called 'Greek Colonization' on local pottery production. In a previous series, a wide range of wares manufactured on site could be determined, ranging from traditional style incised and stamped vessels via matt painted ceramics of regional style to Greek style pottery. The second series presented here was intended to extend and deepen the results obtained and to investigate the variability of the potter's responses to new challenges and demands in the course of Monte Iato's changing indigenous society. These responses were found to present even greater variance than expected before, fitting the overall picture of the site's increasing integration into Mediterranean networks.

1. Introduction

This work is dedicated to Prof. Karl Buchtela on the occasion of his 90th birthday. His patient introduction of radiochemistry and NAA to a young student has been invaluable.

Chemical provenance analyses of ceramics are a promising tool that has been increasingly applied in the past few years for studies on indigenous pottery production in Western and Central Sicily of Pre-Roman Iron Age. Just to mention the survey of Kolb and Speakman (2005) by NAA, followed by numerous other publications that investigated specific sites using various methods (e.g., Montana et al. 2012; 2017; 2019; 2021; Caso et al. 2022). One of the sites under investigation is Monte Iato (852 m a.s.l) in the upper Belice Valley, about 20 km southwest of Palermo (**Fig. 1**), where two different strategies have been implemented recently. By taking an ethnoarchaeometric approach strongly based on mineralogical-petrographic analyses and additional chemical examinations (ICP-OES/ICP-MS), Montana et al. (2021) identified three clay pastes used for the manufacture of Archaic pottery and linked each to the underlaying lithostratigraphic units of the exploited raw clay sources. Regarding the provenance question, two pastes are considered local (*paste-groups II* and *III*), while the third (*paste-group I*) may either be local or originate from the Entella area. Accordingly, at least about 80% of 60 sampled ancient ceramics can safely be considered as produced locally, among them incised as well as matt painted vessels.

Riehle et al. (2021), on the other hand, took a straight chemical NAA-based approach to trace the range of Archaic local pottery production, evaluating the results obtained against the backdrop of sociocultural dynamics on a local and regional scale. Since this provides the groundwork for the current paper, its outcomes must briefly be recalled. Based on the identification of the local chemical fingerprint (NAA-group IatA), it was found that, in addition to kitchen and coarse ceramics, traditional incised and stamped pottery ('Ceramica Incisa') were mainly produced on a local level, a ware typical of interior Western Sicily (Spatafora 1996; Mühlenbock 2015; Trombi 2015). Likewise made in Iatinian workshops were vessels of the 'Ceramica Piumata', locally reproducing a much older ware widespread in Eastern and Southern Sicily of the Late Bronze and Early Iron Age. Against this background, they represent an 'invented tradition' and should be, thus, considered as a mode of local traditionalism (Hobsbawm and Ranger, 2012; Kistler et al., 2017; Buckingham and Antonaccio, 2018). The repertoire of resident potters further included matt painted pottery ('Ceramica Dipinta') in a regional style, which, however, was sampled only in small quantities. Generally, *dipinta* pottery starts to replace *incisa* vessels in great parts of Western Sicily from the early 6th century BCE onwards, keeping largely with the traditional shapes and decorations, though Greek influences are evident (Trombi 2015; Serra 2016). In a sense then,

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they are traditional as well. Many *dipinta* vessels of Iatinian provenance, however, reveal such strong Greek influences that they were previously considered imports from the Greek coastal *apoikiai*. Thus, these *dipinta* wares can be termed Greek style pottery (including mixed style vessels in Riehle et al. 2021). That this strong Greek influence in fact points to a physical presence of individuals from Greek sites is suggested by a Corinthian style roof tile also made at Monte Iato; its stamped Greek inscription XENON (XENOS = foreigner) arguably denotes the potter and/or owner of the workshop that produced such tiles (Kistler 2020, 55).

Considering the pronounced variety in terms of cultural influences among the local pottery traced yet, one thing becomes clear: local production must not be equated with an exclusive production of indigenous (in the sense of traditional) wares, since non-traditional wares have been made on site as well. The term 'local' is thus to be referred strictly to the place of manufacture. Simultaneously, the variety attested for ceramic production is echoed in other contexts and materials at Monte Iato, too. Inhabited since the early 7th century BCE, the hilltop settlement of clustered hamlets made up part of a dense network of inland sites surrounded by Phoenician and Greek coastal settlements within a radius of about 50 km (cf. Ampolo 2012; Öhlinger et al. 2019; Vassallo 2019). The spatial proximity to the nodes of the central Mediterranean obviously affected the Iatinians. First imports of Corinthian pottery appear in the late 7th century BCE, while the share of Greek vessels increases in the subsequent periods, reaching its peak in the first half of the 5th century BCE. However, references to the Greek material world are not constrained to pottery but are evident in the architectonical restructuring of the site's central cult site. Besides the 'Temple of Aphrodite' (ca. 525 BCE), the two-storey 'Late Archaic House' with banqueting rooms (ca. 500 BCE) and some smaller oikos-like structures reveal a strong Greek imprint (Isler 2009, 167–176; Kistler 2020; 2022). Given the site's overall archaeological picture, the selective inclusion of external material culture has been related to socio-political differentiation processes and the negotiation of identities, which had their other side in a simultaneous strong emphasis on traditionalistic aspects (Kistler and Mohr 2016; Kistler et al. 2017; Öhlinger et al. 2021; Kistler 2022). These seemingly paradoxical modes of behavior need to be understood against the backdrop of increased Mediterranean connectivity during the Iron Age, expressed by high mobility and fluidity of people, material culture and ideas, thus providing new opportunities for self-positioning within social entities (including traditionalist emphasis of a pretended better past). A dynamic and multi-layered process, which Ian Morris (2003) has referred to as 'Mediterraneanization', that also had an impact on ceramic production.

The current paper ties directly to the first NAA sample series. Objective of a second sample series presented here was both to refine the data obtained yet as well as to trace local ceramic production by a quantitative and qualitative expansion of the sampled pottery. To this end, notably the corpus of *dipinta* and cooking wares, but also of storage and transport vessels had to be enlarged. Concerning *dipinta* pottery, emphasis has been put on both traditional and Greek style vessels. The additional inclusion of pottery considered as non-local, first and foremost black gloss vessels of suspected Greek origin, served on the one hand to delimit the local production. On the other, it was to provide information about their places of manufacture, thus pointing to the scope of Mediterranean networks engaged with residents at Monte Iato. The broad dataset of two sample series (over 150 samples) permits deep insights into the spectrum of pottery manufactured on site, thus offering a new perspective for analyzing the socio-cultural dynamics on Archaic Monte Iato to which local potters had to respond – in one way or another.

2. Materials and methods

2.1. Neutron activation analysis (NAA)

The basic principles of NAA have been explained many times before, so reference to some in-depth papers will suffice here (Perlman and Asaro 1969; Glascock and Neff 2003; Mommsen 2007; Minc and Sterba 2016). In short, NAA is a method for determining chemical element

Fig. 1. Monte Iato, Western quarter.

concentrations in the clay paste of ceramics that has been established for decades. Presupposition is that vessels bearing the same elemental pattern were made from the same paste and thus in the same place. By sampling suitable reference material, such as misfired pottery and/or wasters, NAA permits the localization of a specific chemical composition (or elemental pattern) and thus the determination of the origin of ceramics in question. NAA is routinely applied in the laboratories of Bonn and Vienna for many years, where up to 30 elements are measured, including numerous trace and minor elements. Detailed descriptions of the workflows of both laboratories have been given elsewhere (Mommsen et al. 1991; Sterba 2018). For the current analysis, grouping was based on the concentration values of the following elements: K, Sc, Cr, Fe, Co, Zn, Rb, Cs, La, Ce, Nd, Sm, Eu, Tb, Yb, Lu, Hf, Ta, Th, and U. In Vienna, compatibility with the statistical data analysis procedures of Bonn (Mommsen et al. 1988; Beier and Mommsen 1994) was intended from the outset, thus data collected in both laboratories are straightforward to compare (Sterba 2018). Consequently, the samples analyzed in Vienna can also be cross-checked with the vast database at the Bonn laboratory, which contains more than 12,500 datasets of ancient pottery from the entire Mediterranean and beyond.

The samplings presented here have been conducted at the excavation house of the Austrian and Swiss Monte Iato mission at San Cipirello (Prov. Palermo). After manual surface removal (0.3 mm) of approx. 1.5 cm^2, least 80 mg core material was extracted from each sherd using an Al_2O_3 drill bit. It is basically assumed that analyzing coarse wares require larger amounts of sampling material than fine wares, to sustain the representativeness of the chemical element pattern detected. However, if corrections regarding potting practices are considered in grouping, such as applying concentration ratios or a best relative fit (Sterba et al. 2009), experience with NAA has shown that the amount of 80 mg of material is sufficient to successfully define patterns in most cases. This has also been revealed by the first sample series at Monte Iato. Any occurring inhomogeneity would lead to numerous loners (Mommsen 2004), which is apparently not the case. We have therefore maintained the procedure of the first series. Processing, irradiation, and measurements of the samples was carried out at Vienna, while the first sample series was analyzed in Bonn. Since the compatibility of both laboratories enables a direct link-up between both (and more) series, the second builds directly on the first.

2.2. Sample selection

The NAA series presented here comprised samples of 97 vessels. As the identification of the local chemical fingerprint was already achieved by the first series (Riehle et al. 2021), the inclusion of further reference material exceeding typological assignments was omitted. Neither has a selection along macroscopically identifiable local fabrics proven to be useful. It should be noted, however, that except for Entella (Guglielmino 2000; Montana et al. 2017), no remains of pottery workshops, kilns, and associated dumps are known so far for indigenous sites in Western Sicily, so the identification of local chemical fingerprints relies heavily on archaeological arguments.

A total of six different classes has been sampled: traditional *incisa* pottery, including handmade and wheel-thrown *attingitoio* and large storage vessels (*pithoi*; $n = 12$); *dipinta* vessels ($n = 25$), focusing particularly on *pithoi* and jugs considered traditional as well as Greek style vessels; handmade and wheel-thrown cooking pots ($n = 18$); slipped *pithoi* with horizontal moldings ($n = 12$); transport amphorae ($n = 8$); black gloss vessels, mainly drinking equipment ($n = 22$), among them K-480 type cups ($n = 12$). Further, for internal control, two matching fragments (*M.Iato136, 137*) of the same vessel were also sampled.

The number n refers to the second sample series, whereas n_{tot} indicates the total of both series in the discussion section. All sampled sherds derive from stratigraphic contexts of the cult site mentioned above, excavated by the Austrian and Swiss missions during the last decades (Kistler et al. 2018; Mohr 2021).

3. Results

Most of the samples taken fall into 11 different chemical element patterns (NAA-groups), representative of 11 various clay pastes used. Of these, five also occurred in the first sample series, while the remaining six were already recorded in the Bonn database. 11 samples are singletons and cannot be assigned to any elemental pattern, six others form three pairs. The vessel sampled twice for internal control also creates a pair (rw1), thus confirming the expected equality of elemental composition. Since singletons and pairs do not admit any further conclusions, these pieces will not be discussed here. A list of concordance of all 97 samples as well as drawings and pictures of selected vessels (**Figs. 4–14**) are given in the online supplement material of this paper. The mean concentration values of the chemical groups discussed are to be found in Table 1. Table 2 provides the best relative fit factor (Mommsen and Sjöberg 2007) for each sample treated here to its group, Table 3 lists singletons and pairs. The concordances to sample numbers of the first series (*M.Iato01–65*) can be found in the Appendix of Riehle et al. (2021). Unrestricted access to the raw data of all samples of both series is provided on the website of the Bonn laboratory: mommsen.hiskp.uni-bonn.de.

In **Fig. 2** the result of an S-based (Venables and Ripley 2002) discriminant analysis (DA) of the 11 different chemical groups is depicted. It shows a peculiar feature: nine of the 11 groups are aligned in concentration space with only two groups (KrPP and X026) well separated and as discussed below, certainly not local to Sicily. In **Fig. 3** the result of a similar DA without the two outlying groups is shown. Again, all nine groups are aligned, now along the parameter LD1 that accounts for 97.7% of the between-group variance. For this set of groups, a cigar-shaped pattern emerges whose width of only 1.2% (LD2) can be attributed to experimental uncertainty. The sum of the remaining third and higher components of the between-group variance is only 1.1%. Such a case occurs, if the two clay pastes at the ends of the line, here groups X027 and IatC, are mixed with different ratios resulting in group positions at the line between these two border pastes (Schwedt and Mommsen 2004). It follows that the nine more or less well aligned groups can be interpreted to represent clay paste mixtures of pastes X027 and IatC in different ratios. This is supported by the concentration values of the nine groups themselves. They are shown in Table 1 in the sequence along the line given by the DA. The concentrations decrease continually from X027 to IatC for nearly all elements with X027 the highest and IatC the lowest. If the mixing interpretation is accepted for all the nine groups, they can be assigned to a Sicilian origin. The location where some of these ‘mixed pastes’ have been used is not fully clear yet, since they include unpublished reference material from different sites. A possible explanation to be further investigated could be that some clay sources in Sicily are geologically, i.e. naturally mixtures of a few or even only two main clays (cf. Montana et al. 2021).

The largest NAA-group by numbers ($n = 22$) shares the chemical element pattern IatA, already identified by the first series as a local chemical fingerprint of Monte Iato. The related pottery spectrum also corresponds to that, including handmade and wheel-thrown incised and stamped *attingitoio* and storage vessels as well as cooking pots. Likewise included are *dipinta* vessels, among them Greek style kraters, traditional jugs and *pithoi*, along with undecorated *pithoi* and a transport amphora. A second group ($n = 15$) is labeled IatB. The included vessels, for which a local provenance was already suspected before on visual criteria, consists mostly of *dipinta* pottery, especially Greek style kraters and traditional jugs decorated with painted birds, as well as cooking pots and another transport amphora. A third group IatC ($n = 10$) includes more *incisa* pottery as well as undecorated *pithoi*, while group IatE ($n = 6$) consists solely of cooking pots. All groups designated with the prefix Iat must be considered local, albeit to varying degrees of certainty, as discussed below.

Rather homogenous in terms of the related pottery assemblage appears the yet unlocated group Ul79 ($n = 15$), consisting exclusively of

Table 1

Average concentration values M in μg/g (ppm) or in weight-%, if indicated, of the 11 groups detected during the second series. All members of the groups present in the joint Bonn-Vienna databank are considered. The number in brackets below the group total refer to the specimens found at Monte Iato (M.Iato:). σ is the standard deviation (root mean square deviation) in %. The individual sample members have been corrected with the best relative factor with respect to their grouping value (Tab. 2). The first 9 patterns, except the non-Sicilian patterns KrPP and X026, are given in the sequence of decreasing concentration values, e. g. La, Sc, both measured with high precision. They can be interpreted as mixtures with different rations of the clay pastes of the 1st and 9th group (see text).

	X027 21 samples, (M.Iato: 2)		**Ul79** 25 samples (M.Iato: 20)		**IatB** 27 samples (M.Iato: 12)		**SilA** 38 samples (M.Iato: 2)		**Ul13** 5 samples (M.Iato: 2)		**IatE** 7 samples (M.Iato: 6)	
	M	σ(%)	M	σ(%)	M	σ(%)	M	σ(%)	M	σ(%)	M	σ(%)
As	14.8	(51.)	7.62	(36.)	7.78	(32.)	6.86	(28.)	11.7	(52.)	10.6	(48.)
Ba	615.	(16.)	433.	(41.)	554.	(57.)	268.	(24.)	615.	(76.)	449.	(36.)
Ca\%	5.63	(32.)	4.66	(16.)	4.93	(59.)	9.89	(25.)	5.02	(65.)	3.75	(69.)
Ce	106.	(3.4)	99.1	(2.8)	88.1	(3.4)	92.2	(2.4)	82.6	(3.1)	81.8	(5.5)
Co	21.7	(8.0)	17.9	(6.3)	16.0	(9.4)	14.3	(8.2)	14.2	(3.5)	16.4	(9.9)
Cr	118.	(12.)	132.	(2.1)	120.	(3.8)	116.	(6.5)	109.	(5.8)	101.	(3.3)
Cs	10.3	(8.5)	9.37	(4.3)	6.69	(8.8)	6.48	(13.)	6.40	(10.)	4.01	(14.)
Eu	1.59	(3.7)	1.58	(3.5)	1.43	(4.3)	1.47	(3.3)	1.35	(3.3)	1.32	(4.1)
Fe\%	5.72	(2.6)	5.19	(3.1)	4.83	(2.7)	4.53	(3.8)	4.62	(2.1)	4.57	(3.8)
Hf	5.38	(8.5)	5.72	(7.7)	5.81	(8.8)	4.70	(7.3)	7.33	(5.8)	6.03	(8.4)
K\%	3.43	(4.7)	2.63	(7.0)	2.14	(4.8)	2.48	(12.)	2.17	(3.5)	1.76	(13.)
La	50.8	(3.3)	47.4	(2.1)	42.1	(3.2)	43.4	(3.8)	38.7	(3.4)	37.7	(6.8)
Lu	0.52	(7.2)	0.47	(8.7)	0.44	(6.7)	0.40	(4.9)	0.42	(2.5)	0.39	(6.0)
Na\%	0.94	(21.)	0.72	(10.)	0.61	(40.)	0.54	(44.)	0.70	(26.)	0.30	(75.)
Nd	40.6	(7.2)	38.7	(15.)	32.4	(19.)	31.8	(7.8)	33.4	(5.3)	31.7	(8.9)
Ni	86.5	(32.)	60.8	(8.6)	55.3	(30.)	82.1	(43.)	49.2	(31.)	49.5	(38.)
Rb	194.	(6.4)	155.	(4.1)	116.	(6.1)	115.	(7.1)	115.	(2.6)	76.2	(11.)
Sb	0.94	(29.)	0.62	(18.)	0.60	(16.)	0.66	(19.)	0.60	(34.)	0.50	(14.)
Sc	22.3	(3.8)	19.1	(3.1)	16.6	(3.0)	16.1	(3.1)	15.4	(2.6)	14.2	(1.9)
Sm	7.69	(4.9)	6.96	(3.6)	6.33	(3.8)	5.71	(7.9)	5.76	(2.0)	5.62	(3.2)
Ta	1.31	(12.)	1.41	(3.4)	1.35	(3.4)	1.25	(5.3)	1.27	(3.6)	1.19	(3.2)
Tb	1.01	(5.3)	0.88	(3.6)	0.80	(4.8)	0.80	(5.9)	0.80	(2.9)	0.72	(2.9)
Th	17.4	(3.7)	14.5	(1.1)	13.4	(6.2)	12.2	(1.9)	12.0	(3.4)	11.7	(3.7)
Ti\%	0.54	(46.)	1.02	(52.)	0.70	(28.)	0.58	(25.)	0.72	(49.)	0.66	(15.)
U	3.56	(17.)	2.96	(7.0)	2.62	(11.)	3.09	(12.)	2.48	(4.7)	2.23	(9.2)
W	3.12	(18.)	2.53	(20.)	2.03	(26.)	1.87	(16.)	1.92	(11.)	1.50	(20.)
Yb	3.46	(4.5)	3.21	(3.5)	3.01	(3.8)	2.69	(3.8)	2.84	(4.2)	2.71	(6.4)
Zn	161.	(8.5)	125.	(3.0)	119.	(7.7)	125.	(13.)	103.	(7.2)	125.	(8.7)
Zr	195.	(24.)	188.	(18.)	202.	(19.)	131.	(43.)	243.	(24.)	196.	(11.)

	SicA 57 samples (M.Iato: 1)		**IatA** 64 samples (M.Iato: 64)		**IatC** 13 samples (M.Iato: 11)		**KrPP** 100 samples (M.Iato: 6)		**X026** 24 samples (M.Iato: 1)	
	M	σ(%)	M	σ(%)	M	σ(%)	M	σ(%)	M	σ(%)
As	17.8	(45.)	5.11	(37.)	5.30	(72.)	43.3	(38.)	10.5	(43.)
Ba	513.	(44.)	482.	(34.)	465.	(13.)	553.	(12.)	507.	(35.)
Ca\%	9.32	(23.)	11.7	(39.)	12.4	(21.)	4.92	(28.)	7.64	(33.)
Ce	76.9	(1.5)	73.2	(2.6)	57.1	(4.1)	75.7	(2.8)	59.3	(2.3)
Co	10.9	(9.4)	14.2	(8.8)	10.9	(10.)	37.0	(6.7)	29.6	(6.0)
Cr	87.8	(4.5)	95.6	(4.2)	86.9	(3.7)	496.	(8.2)	325.	(11.)
Cs	4.98	(9.5)	5.04	(13.)	3.47	(6.6)	13.2	(12.)	4.29	(9.8)
Eu	1.27	(2.5)	1.17	(2.5)	0.94	(3.7)	1.37	(3.0)	1.07	(2.4)
Fe\%	3.87	(2.9)	3.87	(4.0)	3.16	(2.3)	5.95	(3.6)	5.19	(4.6)
Hf	7.06	(8.4)	3.81	(9.4)	3.30	(5.4)	4.31	(8.5)	4.10	(8.3)
K\%	1.78	(9.8)	1.84	(6.4)	1.43	(11.)	2.93	(5.4)	2.13	(12.)
La	36.1	(2.2)	35.9	(2.2)	28.7	(4.1)	35.2	(2.6)	27.6	(2.7)
Lu	0.40	(4.5)	0.33	(5.5)	0.28	(6.3)	0.49	(3.8)	0.43	(8.2)
Na\%	0.62	(24.)	0.24	(28.)	0.14	(12.)	0.60	(15.)	1.08	(25.)
Nd	29.1	(5.9)	29.3	(13.)	21.8	(12.)	31.9	(6.0)	22.6	(11.)
Ni	60.1	(41.)	61.6	(38.)	42.6	(18.)	410.	(10.)	263.	(18.)
Rb	90.2	(6.9)	94.9	(8.1)	65.5	(6.8)	162.	(5.6)	101.	(5.3)
Sb	0.60	(16.)	0.51	(18.)	0.38	(17.)	1.88	(22.)	0.64	(17.)
Sc	13.1	(2.3)	13.6	(2.0)	11.3	(1.6)	24.2	(3.7)	20.5	(5.4)
Sm	5.25	(7.3)	5.12	(2.2)	4.10	(3.4)	6.22	(4.1)	4.57	(5.1)
Ta	1.12	(3.6)	1.02	(4.5)	0.91	(2.4)	0.89	(5.9)	0.73	(9.7)
Tb	0.74	(5.7)	0.63	(4.2)	0.52	(2.1)	0.84	(6.2)	0.71	(6.2)
Th	11.1	(2.6)	9.99	(2.6)	7.93	(2.7)	12.3	(2.5)	11.1	(2.8)
Ti\%	0.77	(61.)	0.78	(24.)	0.96	(22.)	0.49	(29.)	0.47	(39.)
U	2.64	(15.)	2.61	(10.)	2.35	(9.2)	2.44	(14.)	1.76	(17.)
W	1.78	(17.)	1.60	(19.)	1.25	(21.)	2.46	(19.)	2.29	(22.)
Yb	2.72	(3.3)	2.28	(4.5)	1.93	(7.6)	3.14	(4.0)	2.77	(5.8)
Zn	92.2	(9.6)	112.	(12.)	103.	(6.7)	137.	(9.3)	102.	(12.)
Zr	216.	(30.)	147.	(20.)	116.	(18.)	164.	(20.)	153.	(17.)

Table 2
Best relative fit factors of the samples of the second series with respect to their group. Samples not mentioned are chemical loners or single pairs listed in Tab. 3.

IatA	M.Iato66(1.17), M.Iato69(0.95), M.Iato070(1.03), M.Iato74(1.00), M. Iato76(1.08), M.Iato77(1.42), M.Iato100(0.81), M.Iato102(0.94), M. Iato107(1.16), M.Iato109(0.99), M.Iato111(0.98), M.Iato112(0.88), M. Iato113(1.03), M.Iato116(0.82), M.Iato118(1.03), M.Iato130(0.89), M. Iato133(0.96), M.Iato135(0.99), M.Iato146(0.97), M.Iato147(0.84), M. Iato149(0.84), M.Iato154(1.04), M.Iato157(0.92), M.Iato161(0.94)
IatB	M.Iato101(0.94), M.Iato103(0.96), M.Iato104(0.99), M.Iato105(1.23), M. Iato108(0.95), M.Iato110(1.16), M.Iato114(0.97), M.Iato121(1.19), M. Iato134(1.08), M.Iato144(0.95), M.Iato159(0.97), M.Iato162(1.09)
IatC	M.Iato67(0.97), M.Iato68(1.05), M.Iato75(1.04), M.Iato78(1.10), M. Iato148(0.92), M.Iato150(1.11), M.Iato152(1.07), M.Iato153(1.04), M. Iato155(1.05), M.Iato156(0.88)
IatE	M.Iato119(0.92), M.Iato122(1.04), M.Iato123(0.99), M.Iato124(0.85), M. Iato131(0.92)
X027	M.Iato83(0.97), M.Iato95(1.02)
Ul79	M.Iato71(1.00), M.Iato72(1.00), M.Iato73(0.97), M.Iato80(1.02), M.Iato82 (1.04), M.Iato85(0.99), M.Iato86(0.99), M.Iato87(0.99), M.Iato88(1.04), M. Iato89(1.05), M.Iato90(1.02), M.Iato91(0.98), M.Iato93(1.04), M.Iato97 (1.05), M.Iato98(1.07)
SilA	M.Iato79(1.08), M.Iato106(1.17)
Ul13	M.Iato145(0.96), M.Iato160(0.97)
SicA	M.Iato81(0.92)
KrPP	M.Iato84(0.97), M.Iato92(0.99), M.Iato94(1.02), M.Iato96(0.98)
X026	M.Iato138(0.96)

Table 3
List of singletons and pairs detected in the second sampling series. Pair rw1 refers to the same vessel sampled for internal control.

Singletons	Pair rw1	Pair rw2	Pair rw3
M.Iato99, M.Iato117, M.Iato120, M.Iato125, M.Iato128, M. Iato132, M.Iato139, M.Iato140, M.Iato141, M.Iato151, M. Iato158	M.Iato136, M.Iato137	M.Iato126, M.Iato127	M.Iato142, M.Iato143

black gloss vessels. These include almost all types of K-480 cups sampled at Monte Iato to date (15 out of 16), as well as C-type cups and a stemmed dish. Three more groups are also entirely consisting of black gloss ceramics of various types: group KrPP ($n = 4$) from Athens, well attested in the Bonn database, the numerically less well documented group X027 ($n = 2$), in all probability from a western colonial site for archaeological reasons given below, and finally SicA ($n = 1$) from Sicily. Most likely to be localized in Sicily are the groups SilA ($n = 2$), consisting of *incisa* and *dipinta* pottery, and Ul13 ($n = 2$), consisting of a *dipinta* vessel and an undecorated *pithos*. Finally, from the Northern Aegean comes group X026 ($n = 1$), comprised of a transport amphora.

In cross-comparison between the local group concentration data given in Montana et al. (2021, Table 7) with those of our local groups in Table 1, some discrepancies appear. It should be noted, however, that our results consider method-dependent measurement uncertainties as well as dilution effects by applying the 'best relative fit factor' (Beier and Mommsen 1994; Mommsen and Sjöberg 2007; Sterba et al. 2009, 1584-1586), and that some concentration values reported in Montana et al. (2021) display large scatters. Thus, the discrepancies are presumably due to the different procedures of data evaluation. Yet, this does not seem to affect the matching basic conclusions of either approach, as indicated by nine samples examined in both studies (*M.Iato36, 45–49, 103–104, 114*). According to NAA, all nine samples are spread among two local groups (IatA and IatB, see below). According to Montana et al. (2021), six of them fit into *paste-groups II* and *III*, both considered equally local, while the remaining three belong to *paste-group I*, for which a local origin is said to be less certain but quite possible.

4. Discussion

4.1. Local pottery

In Riehle et al. (2021), NAA-group IatA has been identified as a local chemical fingerprint of Monte Iato. Instead of strong reference material such as misfires or potter's debris lacking at the site to date, a typological wide reference group has therefore been sampled, for which ceramics an import to this extend was considered unlikely for several arguments: vessel size (transport), use (everyday items), and/or production technique (handmade or wheel-thrown). These included architectural ceramics, loom weights, large storage vessels, and handmade cooking pots, all sharing the same pattern IatA. Moreover, IatA was found in the majority of all assignable samples (68%), which, according to the "criterion of local abundance" (Rice 2015, 341; Minc and Sterba 2016, 441), also suggests a local origin. Such a conclusion, grounded in the totality

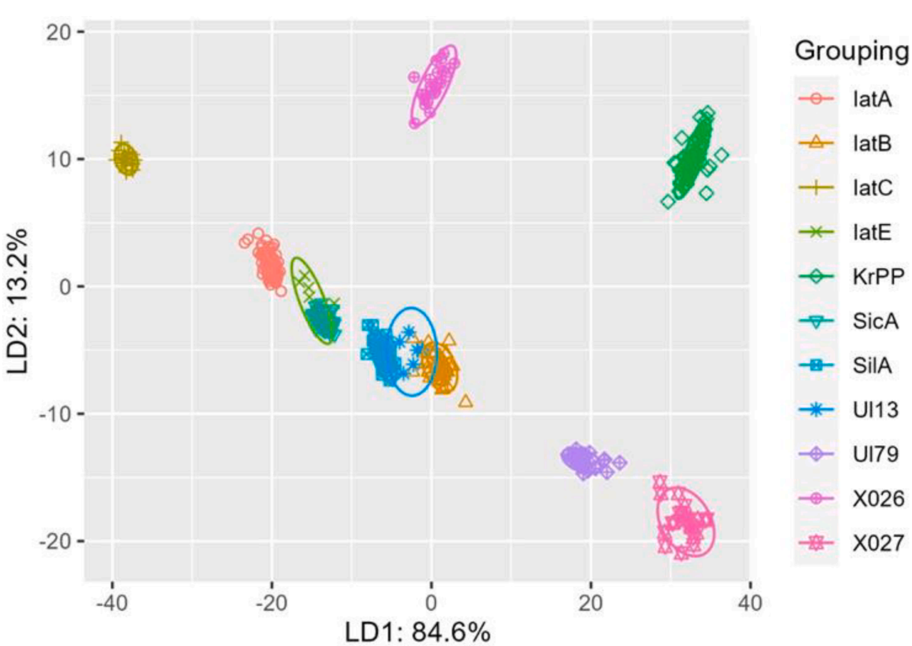

Fig. 2. Result of a discriminant analysis of 381 samples, corrected for dilution, assuming 11 clusters using all elements given in tab. 1 except As, Ba, Na, and Ti. Plotted are the discriminant functions LD1 and LD2, which cover 84.6% and 13.2% of the between-group variance. The ellipses drawn are the 2σ boundaries of the groups. Both non-Sicilian groups KrPP (vicinity Athens) and X026 (archaeologically assigned to the Northern Aegean) are well separated. For the Sicilian groups positioned along a line in concentration space see Fig. 3.

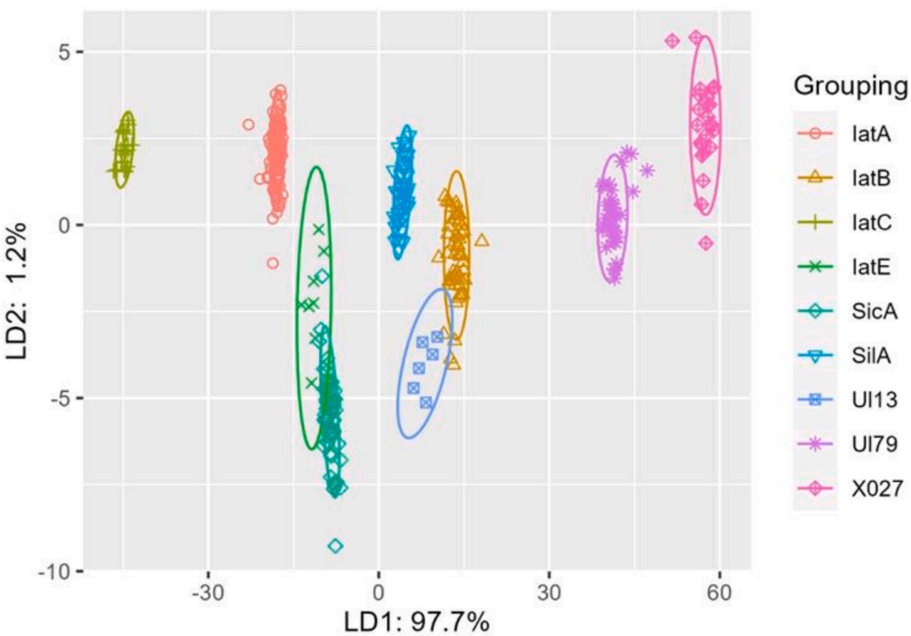

Fig. 3. Result of a discriminant analysis of 257 samples, corrected for dilution, assuming 9 clusters using all elements given in tab. 1 except As, Ba, Na, and Ti. Plotted are the discriminant functions LD1 and LD2, which cover 97.7% and 1.2% of the between-group variance. The ellipses drawn are the 2σ boundaries of the groups. The series of these groups from X027 to IatC are positioned along a line in concentration space (compare Fig. 2) as the variance LD1 is close to 100% and LD2 is small. Such a cigar-shaped structure in concentration space indicates clay paste mixtures with different ratios of the 2 border pastes, groups X027 and IatC (see text).

of arguments, is basically consistent with Montana et al. (2021), even though the data cannot be directly compared without an extensive interlaboratory study: four specimens of IatA belong to *paste-group II* (*M. Iato45–48*), two to *paste-group III* (*M.Iato36, 49*), both considered local.

The localization of IatA thus achieved was further confirmed by the second sample series. Even considering the identification of other local groups and a stronger emphasis on wares for which a non-local origin was suspected, this pattern still accounts for the lion's share ($n_{tot} = 62$; 39%) of all sampled pieces to date ($n_{tot} = 162$). Included are large storage vessels and *pithoi* ($n_{tot} = 9$), thus a class of pottery which is recently thought of having also been negotiated on a regional level, especially for trading purposes between the hinterland and Greek coastal sites (Albanese Procelli 2021; Valentino 2017). Indeed, at least two specimens from Monte Iato are made of a non-local paste (*M.Iato79, 145*). The much larger part, however, belongs to pastes which must be considered local for several reasons mentioned, archaeologically as well as chemically. Their quantitative dominance may be explained by the emerging local production of transport amphorae in the Late Archaic period (see following section), now serving as containers for trading purposes of agricultural and/or pastoral products. In any case, imports of *pithoi* seem to have played a rather marginal role at Monte Iato that time.

In addition, the local origin of handmade cooking pots (*M.Iato118, 130, 133*) and *incisa* vessels (*M.Iato66, 69, 70, 74, 76, 77*), all part of IatA, are consistent with the results of the first sample series. The same applies to traditional types of *dipinta* pottery, including trefoil jugs decorated with a stylized bird (*M.Iato111, 161*), widespread among the indigenous settlements of the Valle del Belice (Russenberger 2015, 112–118; Fuchs Käch 2001). Greek style *dipinta* pottery of IatA includes three colonette kraters of a unique type (*M.Iato110, 112, 113*) discussed in the next section. Finally, the sample *M.Iato135* (**Fig. 4 suppl.**) must be mentioned, whose local assignment by the current series is surprising. It belongs to a transport amphora, which draws on Greek type features, but morphologically represents a hitherto single case (Palaczyk, forthcoming). An Iatinian production of Western Greek amphora types has been suspected recently due to petrographic studies (Corretti and Michelini 2020), to which NAA now adds a 'mixed' type. Hence, this finding expands the wide spectrum of locally produced ceramics of IatA, which on the one hand echoes external Mediterranean impacts, but on the other serves demands for traditional and traditionalist type pottery.

The ceramics of IatB differ in wares. The complete absence of traditional *incisa* and traditionalist *piumata* pottery is striking. The overlap of both groups are limited to transport amphorae (*M.Iato144*), handmade cooking pots of a common type (*M.Iato121, 134*) and *dipinta* vessels. In fact, IatB mainly consists of *dipinta* pottery. Among them are four trefoiled bird jugs (*M.Iato101, 105, 159, 162*; **Fig. 5 suppl.**) of a traditional type already discussed above. Concerning Greek style ceramics, five more column kraters require closer examination (*M. Iato103,104, 108, 109, 114*; **Fig. 6 suppl.**). In shape clearly inspired by Greek mixing bowls, the custom of matt paintings refers to the traditional *dipinta* sphere. Distinctive for some of them is their decoration of horizontal wavy bands, reminiscent of the letter w. To date, kraters with such decoration are documented exclusively at Monte Iato, where a total of 18 specimens have been unearthed within the cult site, previously serving as mixing bowls for the consumption of wine and/or beer (Kistler 2017, 116–119; Mohr and Notarstefano 2017). Due to the local exclusivity of the kraters as well as to the shared types of handmade cooking pots with IatA, IatB must also be considered local. Three kraters sampled with NAA (*M.Iato103, 104, 114*) were also examined by Montana et al. (2021) and assigned to *paste-group I*. The authors assume either Monte Iato or, due to some chemical similarity, Entella as the place of origin of this paste. However, considering the given NAA results as well as archaeological arguments, Entella seems less likely.

Thereby, Greek pottery was not the only source of inspiration for local production, at least not in a direct way. Given shape, decoration and chronology, two bi-handled *dipinta* cups of IatB (*M.Iato107, 115*; **Fig. 7 suppl.**) are reminiscent of Western Phoenician cups of the 7th and 6th centuries BCE, which in turn selectively incorporate features of Greek Late Geometric ceramics (Docter 2014; Guirguis 2010, 204 Figs. 7 and 8; 209 Fig. 22; Briese and Docter 1992). A shared repertoire of decorations and motifs between Western Sicilian and Western Phoenician *dipinta* pottery during the Archaic period has already been noted (Spagnoli 2019, 9–10), and local adaptations of Phoenician shapes are not completely unknown either, as Mühlenbock (2015, 257) has demonstrated for Monte Polizzo. It is worth noting, however, that among the sparse finds of (Western) Phoenician pottery in interior Sicily, drinking cups are almost unknown (Orsingher et al. 2020, 259–262, 289 Table 3). This generally raises questions about the modes of adoption of non-traditional shapes and decorative patterns into the local ceramic repertoire, which cannot be adequately addressed here.

That we are faced at Monte Iato with a rather slow and gradual processes of appropriation, probably assigned to a community of practice according to Balco (2018), might be illustrated by the different technical execution of the two cups: based on stratified comparisons, the rougher specimen (*M.Iato 107*) is about one generation older than the other.

With considerable certainty, an Iaitinian origin must also be assumed for the groups IatC and IatE, although the evidence is not as strong as for the other two local groups. IatC consists of one handmade and one wheel-thrown *incisa attingitoio* (*M.Iato67, 68*), two *incisa* storage vessels (*M.Iato75, 78*), and undecorated and molded *pithoi* (*M.Iato148, 150, 152, 153, 155, 156;* **Fig. 8 suppl.**). It is the IatC *piumata* bowl of the first series (*M.Iato23*) fully compatible to the types in group IatA, that indicates a local provenance. The same applies to the storage vessels and the relatively large number of *pithoi*. The local origin of IatE is suggested by its almost exclusive composition of handmade cooking pots (*M. Iato119, 122–124, 131*) which corresponds to the types found in IatA and IatB. Also included is *M.Iato129* (**Fig. 9 suppl.**), the only sampled wheel-thrown cooking pot of a Greek type, a *chytra* (Öhlinger et al. 2021, 181), that could be assigned to a chemical group, yet. Another indication of a probable local provenance of IatE is a loom weight of the first sample series (*M.Iato32*).

The number of four local chemical groups (IatA, B, C, E) assumed here seems high at first glance. However, both the large number of samples ($n_{tot} = 162$) and the chemical heterogeneity of clays on a local and regional level must be considered: by fewer samples of ancient pottery, Montana et al. (2021) traced up to three local paste groups at Monte Iato; for Monte Polizzo, located about 37 km southwest of Monte Iato, three local paste groups were identified among 44 sampled ceramics of the Archaic period (Montana et al. 2012), and the 68 samples of Early Iron Age ceramics from Central Sicilian Polizello are also spread among three paste groups apparently considered local (Caso et al. 2022). In fact, it can be assumed that the four local NAA-groups of Monte Iato are at least partially the result of different paste recipes, for which local clays were mixed in different proportions depending on the requirements (for clay mixing, see also *paste-group III* in Montana et al. 2021). This is further indicated by the composition of the pottery assemblages of each local NAA-group: IatA consist of nearly all sampled wares (including traditionalist *piumata* vessels), IatB covers largely *dipinta* drinking equipment of Greek, traditional but also of Western Phoenician influences, IatC occurs just in traditional pottery, and IatE almost exclusively in cooking pots. Accordingly, ceramics for drinking, mixing, and pouring are found almost exclusively in IatA and IatB, although IatB is much less tied to traditional requirements then all other local NAA-groups. The emerging picture thus suggests a kind of specialization in terms of wares in relation to the pastes (that is NAA-groups), linked to socio-cultural demand. However, contrary to frequent assumptions drawing on the 'standardization hypothesis' as recently reviewed by Kotsonas (2014, 12–13), specialization at Monte Iato does not indicate a reduction of variation, conceived as the relative degree of heterogeneity of artifact attributes (Ibid., 8), but rather an expansion of it.

4.2. Non-local pottery

Among the non-local groups, KrPP undoubtedly comes from Athens (Mommsen et al. 2016, 376–378; Mommsen and Schöne-Denkinger 2009, 84–85). It has already been traced in two C-type cups of the first series (*M.Iato 55, 56*), and is to be found in more black gloss pottery of the second: two C-type cups (*M.Iato92, 96*; **Fig. 10 suppl.**), a stemmed dish (*M.Iato84*) and a salt cellar (*M.Iato94*) must now be added, already suspected as coming from Athens by visual examination. Not yet localized is group Ul79, whose related pottery of both series seems to be quite homogeneous in terms of wares. These are exclusively black gloss ceramics, including C-type cups ($n_{tot} = 3$; **Fig. 11a suppl.**) and a stemmed dish (*M.Iato87*), for which an Attic origin was previously assumed. However, this assumption is challenged not just by lacking correspondence with the well-known Attic elemental patterns but also by the high number of K-480 cups of different sub-types ($n_{tot} = 15$; **Fig. 11b suppl.**) within Ul79. For these cups, widespread in Western and Central Sicily, Greek Himera is considered the main production site (Vassallo 1996; Alaimo et al. 2000). Given the fact that at Monte Iato all vessels related to Ul79 follow Greek resp. 'colonial' types, a Greek *apoikia* seems quite possible as the place of origin of this group, and Himera would be a proper candidate.

More black gloss pottery was considered imports from Athens, which now needs to be corrected. These include a stemmed dish (*M.Iato83*) and a salt cellar (*M.Iato95*; **Fig. 12 suppl.**), which both are members of chemical element pattern X027. Although this NAA-group could not be localized yet, its typological composition of mainly unpublished material from various sites in the western Mediterranean points to a 'colonial' Greek background. This is supported by the DA discussed above, indicating Sicily as the potential region of origin. On the other hand, X027 has also been detected in a so-called (pseudo) Chalcidian amphora of the Tübingen collection (Riehle and Mommsen, in press). Although Rhegion on the mainland side of the Strait of Messina is considered the main place of production for this kind of pottery, there is growing evidence that it was manufactured on the other side of the Strait as well (Iozzo 2011; Barone et al. 2005). It certainly needs more research to clarify this question.

The other NAA-groups identified in the present series will be discussed here only in passing, since they have not yet been sufficiently differentiated and/or localized. However, three of the four groups (SicA, SilA, Ul13) include *incisa* and *dipinta* pottery, typical for interior Western Sicily. This applies, for instance, to another bird jug (*M.Iato160*) as well as to a regional adaptation of a Greek cup with everted rim (*M.Iato106;* **Fig. 13 suppl.**), which, in addition to Monte Iato (*M.Iato53*), were also produced in other indigenous sites in western Sicily, including Entella (Guglielmino 2000, 706), Segesta (Serra 2016, 44), or Monte Polizzo (Mühlenbock 2015, 256; with further examples Balco 2018, 188). We therefore suspect a Western Sicilian origin of these vessels beyond Monte Iato, though future research is needed for a better differentiation and localization of the NAA-groups mentioned. Finally, the last piece to be discussed here originates from further away. It is the fragment of a transport amphora (*M.Iat138;* **Fig. 14 suppl.**) previously classified as Northern Aegean (Palaczyk, forthcoming), which now can be confirmed by NAA. The amphora belongs to group X026 for the first time detected in a sample series from Northern Greece, probably to be localized around the Thermaic Gulf (Gimatzidis, forthcoming).

5. Conclusion

The results of the second sample series presented here could decisively broaden those of the first. Altogether, an extraordinarily large dataset is now available, providing in-depth views of multiple aspects of local pottery production at Monte Iato in the Archaic period (6th to 5th century BCE). Up to four local clay pastes (=NAA-groups) could be identified, employed for most of the various wares sampled yet. These include kitchen and coarse wares that, like *incisa* and certain types of *dipinta* ceramics, fit well to the indigenous world of Western Sicily, as broadly perceived. Influence of Greek pottery on local production, already noted in the first sample series, could be confirmed, the evidence substantially enlarged, and extended now to transport amphorae. In fact, a link between local pottery crafts and Greek individuals is suggested not least by the XENON inscription of a Corinthian style roof tile made on site. What is new, however, is that apparently Western Phoenician drinking vessels were also a source of selective appropriation, thus reflecting the whole field of transcultural influences in Western Sicily. This does not at all imply that elements of these influences were considered 'Greek' or 'Phoenician' in ethnic terms by the Iaitinians. Rather, it should be assumed that they were connecting factors to an increasingly coalescing Mediterranean world, represented by their neighbors, and perceived as 'modern' from an Iaitinian perspective. The simultaneous local production of traditionalist *piumata* vessels is only the other side of the coin. First and foremost, the local sphere remained the most important point of reference. This is illustrated not least by the site-specific decoration of the Greek style *dipinta* kraters, which can arguably be seen as a local identity marker (Kistler 2017); against an alternative interpretation of the matt paintings as a trademark speaks both, the exclusive occurrence of the vessels on site, as well as their detection in two distinct local NAA-groups. Given these results, it turned out once again that for pottery production at Monte Iato, the term ‘local’ cannot simply be equated with ‘indigenous’.

Yet, the recent outcomes not only reveal what kind of pottery was manufactured on site. Furthermore, considering the range of wares of each local NAA group, a certain pattern becomes apparent: IatA covers virtually the entire spectrum of wares, IatE was found primarily in cooking pots, and IatC mainly in traditional pottery. Conversely, given the absence of *incisa* and *piumata* ceramics and a strong receptivity to external influences especially for its *dipinta* vessels, IatB appears to be the least traditional. Thus, for at least three groups, focal points of production emerge, although overlaps undoubtedly exist. It certainly goes not without problems to infer the organization of pottery production from the chemical composition of clay pastes alone (Arnold 2000). The relation of local NAA-groups to wares as attested for Monte Iato, however, suggest at least a rudimentary specialization in terms of the latter. This does not indicate that each paste and the ware made of it can be linked to a specific facility, so that there were four workshops on site. Rather, the presence of handmade cooking pots, presumably manufactured at the household level and found in almost all local NAA-groups, indicates a strong influence of the exploited raw material on the chemical composition of each clay paste, arguably reflecting spatial zones of resource extraction (cf. Montana et al. 2021) instead of individual workshop recipes. Likely, a differentiation of local production took place within these zones. At Monte Iato, then, specialization about pottery is tied to spatial aspects, while there is no evidence of an overarching reduction in variation as a potential consequence. How many workshops and households might have operated in each zone, on the other hand, is impossible to assert without excavating them at least partially.

A huge share of the local pottery was produced for consumption at the cult site around the Late Archaic house and Temple of Aphrodite, where almost all the samples presented here come from. It set the stage for social differentiation processes and the negotiation of identities, which, through the related demand for material culture, obviously had a strong impact on local ceramic production. Local potters responded to this demand, whether it was traditional *incisa attingitoio*, traditionalist *piumata* bowls or Greek-style drinking equipment. The fact that this cult site played an essential role not only for the local population but was also of meaning on a supra-regional level (Kistler and Mohr 2015, 395–398; Kistler et al. 2018, 260–263; Öhlinger et al. 2021, 186), is further illustrated by the various non-local provenances of *incisa* and *dipinta* wares found within the sanctuary. If these are not considered trading goods, which seems unlikely given the local manufacture of vessels of the same type, they are probably brought to the sanctuary by non-local visitors and deposited there after the end of the celebrations (Kistler et al. 2018, 260–263). Whether the black gloss pottery imported from Athens or Sicilian sites has been left by residents, visitors, or exchange, however, must remain unclear yet. In any case, the number of non-local groups ($n_{tot} = 9$) testifies to the considerable involvement of Archaic Monte Iato in regional and supra-regional networks; even more considering that the two NAA sample series were mainly concerned with local pottery production while the provenance of imported vessels was only addressed besides.

CRediT authorship contribution statement

Kai Riehle: Conceptualization, Methodology, Investigation, Writing – original draft, Visualization. **Erich Kistler:** Conceptualization, Writing – review & editing, Supervision, Funding acquisition. **Birgit Öhlinger:** Conceptualization, Resources, Writing – review & editing, Visualization. **Johannes H. Sterba:** Methodology, Formal analysis, Investigation, Writing – review & editing. **Hans Mommsen:** Methodology, Formal analysis, Investigation, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jasrep.2023.104111.

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