Neutron Activation Analysis of Aegean and Aegeanising Ceramics from Roca Vecchia and the Circulation of Pottery in Southern Italy

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Abstract: This article reports the results of an archaeometric study using NAA on 20 samples of wheelmade fine-ware pottery and one pithos from Roca Vecchia in Apulia. The study aims at elucidating the circulation of Mycenaean-type and Italo-Mycenaean-type vessels across southern Italy. For comparison with Punta di Zambrone, we have focused on ceramics from the RBA levels of Roca Vecchia, as this is a coastal settlement, which, according to previous studies, yielded both Aegean imports and local or regional Italo-Mycenaean products, all well-stratified in a continuous vertical settlement sequence. The chemical analysis identified a few imports from Greece (mainly from Achaea/Elis) and many Apulian products (forming two chemical groups), some of which adhere closely to the Mycenaean style, while others are of Italo-Mycenaean type. These Apulian chemical groups are absent from the previously analysed pots from Punta di Zambrone. One medium coarse pithos from Roca Vecchia turned out to be an import from the southern plain of Sybaris, i.e. the same region that is represented with a few Mycenaean fine-ware vessels at Punta di Zambrone.

Keywords: Aegean-type pottery, Italo-Mycenaean pottery, Mycenaean pottery, Neutron Activation Analysis (NAA), pithos, Punta di Zambrone, Roca Vecchia, Sybaris plain

The Research Questions

During the second half of the 2nd millennium BCE in southern Italy we are mainly dealing with a rather wide spectrum of wheelmade ceramics that were either imported from the Aegean or produced under the variable influence of Aegean technological knowhow and typological as well as stylistic influences. Regarding the local products, we can differentiate between two typological/stylistic traditions followed by the potters in the southern Italian workshops. The first tradition is a Mycenaean one and follows quite closely the rules of Mycenaean Greece in terms of shapes, motifs and decorations as well as the regular combinations of these traits. By contrast, the second tradition combines typological and stylistic traits from different regions of origin including Mycenaean Greece, Late Minoan Crete and southern Italy to variable degrees. In this way, the potters created specific Italo-Mycenaean products that remained geographically restricted. Such local pot-making practices, which eclectically combined elements of different manufacturing traditions, are known from all over the central and eastern Mediterranean. Using an overarching typological category, the products of these decidedly local products can be classified as Aegeanising ceramics as opposed to Aegean-type ceramics. The latter were also locally produced in

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many areas around the Mediterranean, but they closely reproduced either Mycenaean or Minoan prototypes and sometimes – especially in the case of high-quality products – can only be recognised as local products made outside of the Aegean by means of chemical analyses.[5] The results of archaeometric provenance analyses should be compared to those of typological and stylistic examination, in order to arrive at a comprehensive historical interpretation of the phenomenon of wheelmade pottery in Middle to Final Bronze Age southern Italy.

The problem of pottery circulation in southern Italy during the later 2nd millennium BCE has often been discussed with reference to both archaeological and archaeometric data. Richard Jones and Sara Levi recently used discriminant analyses of Italo-Mycenaean pots in order to differentiate between regional production series. Separate discriminant analyses of ICP-ES and AAS results showed broadly comparable results for Apulia alone (ICP-ES data of Torre Santa Sabina, Roca Vecchia and Coppa Nevigata) and Apulia, Basilicata and Calabria in combination (AAS data of Porto Perone, Termitito and Broglio di Trebisacce). The different sites appear quite well separated from each other in the discriminant analysis plots.[6] This supports in principal an interpretation assuming many different production centres for Italo-Mycenaean pottery, an interpretation that is also based on the specific, regionally restricted distribution patterns of some Italo-Mycenaean types.[7] However, in both published discriminant analyses plots, some single samples appear inside the borders of a different local group, which suggests some limited circulation of these pottery products within southern Italy.[8]

The problem of inter-regional transport of Italo-Mycenaean pottery resurfaced when we were looking for an explanation for the composition of the Mycenaean- and Minoan-type pottery assemblage found at Punta di Zambrone in southwestern Calabria.[9] Based on NAA results and in contrast to the picture offered by several other Recent Bronze Age (RBA) settlements, the Zambrone assemblage is exclusively composed of imports. For the time being, we are disregarding the chemical loners that at the moment cannot be assigned to any provenance region. However, we could exclude with high probability a local production at Punta di Zambrone on the basis of chemical comparison with local and regional claybeds. Interestingly, the imports at Punta di Zambrone predominantly come from various regions in western Greece and on Crete, but one chemical group found its match in southern Italy. This is group SybB that can be assigned to the southern plain of Sybaris by petrographic analyses of two chemical group members found at Broglio di Trebisacce[10] (see also below).

The presence of northern Calabrian pottery products (SybB) opened up the possibility that the population in other southern Italian regions might also have contributed to the composition of the assemblage at this southern Calabrian site (Punta di Zambrone). We can formulate two hypotheses on the main role that the southern Italian communities played in the inter-regional distribution of Aegean-type ceramics. Either they were exporting their own products to other harbour sites such as Punta di Zambrone by means of direct exchange contacts of whatever type, or their harbours functioned as stop-over ports and exchange places for Aegean products on the route from Greece to the Tyrrhenian Sea. Of course, a combination of the two possibilities would be a third plausible hypothesis.

If the first hypothesis reflects the Bronze Age reality to a larger degree, we would expect to find pots of different southern Italian regions at Punta di Zambrone. However, a larger scale inter-

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5 We thus underline the need to differentiate clearly between local and regional Italo-Mycenaean types (and typological elements) on the one hand, and Minoan and Mycenaean types on the other (Guglielmino 2005, 641–642, pls. 65d–e, 66c; Jung 2006a, 16–19), in contrast to other proposals, in which all wheelmade Aegean-type and Aegeanising pottery vessels made in Italy are united in the same typology without differentiation of the different traditions they depend on (Bettelli 2014).

6 Jones – Levi 2014, 271–272, fig. 4.39–4.40.

7 Bettelli 2002, 64–68, fig. 22B; cf., however, Jung 2006b, 418 n. 83.

8 Cf. Jones – Levi 2014, 271–272, fig. 4.39–4.40.

9 Jung et al. 2015a.

10 Jung et al. 2015a, 459.

regional exchange of Italo-Mycenaean ceramics does not seem to be indicated by the published analytical results of the Jones and Levi team. At Punta di Zambrone the only other Italian region represented by their Mycenaean-type products is the southern plain of Sybaris (see above). Their products amount to 9% of the analysed vessels.[11] The Bonn database includes 850 samples taken from vessels found in southern Italy and Sicily. Nevertheless, some products of other Italian regions might be hidden among the 20% of so far non-assignable vessels of the Zambrone sample.

If the second of the possibilities mentioned above illustrates the predominant way of transporting pottery, the Mycenaean-type pots produced in the Sybaris plain that reached Punta di Zambrone might have been added in Calabria to the pottery imports that were shipped from Greece and were the main products of interest for the community in the southern Tyrrhenian. In this case we may expect to find a similar spectrum of Greek imports in port settlements lying on the route between Greece and Tyrrhenian Calabria. When searching for such intermediate stations, a first region to look at would, of course, be northern Calabria and, specifically, the southern plain of Sybaris, from where some of the Aegean-type vessels found at Punta di Zambrone originated. Analytical results (obtained with different analytical techniques) exist for two sites on the Sybaris plain. These are Torre del Mordillo, located on the central plain and probably controlling most of the plain in the Middle and Recent Bronze Age,[12] and Broglio di Trebisacce, on the northern fringe of the plain. In both cases, the analysed Aegean-type and Aegeanising ceramics mainly come from RBA and specifically from RBA 2 contexts[13], yet they are not strictly contemporaneous with the RBA 2 contexts excavated at Punta di Zambrone. Most of the relevant layers from the Sybaris plain post-date the deposits from the fortification ditch of Punta di Zambrone.[14] In both of the northern Calabrian settlements, Jones, Bettelli, Levi and Vagnetti classified the wheelmade fine-ware pots as predominantly Italo-Mycenaean, i.e. as of local/regional origin. This applies to all chronological phases examined by those authors.[15] Thus, the resulting picture of quantitative relations between local and imported wheelmade ceramics is exactly the reverse of the one we obtained at Punta di Zambrone. This means the northern Calabrian imports at Punta di Zambrone most probably did not reach this southern Calabrian port together with Greek imports in the framework of down-the-line exchanges between harbours positioned along the southern Italian coasts. However, this conclusion is necessarily a preliminary one, and Mycenaean-type material from other southern Italian sites located on the coastal route between western Greece and southern Italy needs to be examined in order to further scrutinise it.

We have to turn to Apulia in order to find a coastal site of the Recent Bronze Age located to the east of Punta di Zambrone, on the route to Greece, and at the same time yielding a similar Aegean pottery assemblage that is dominated by Greek imports. Torre Santa Sabina, Scoglio del Tonno and Roca Vecchia are sites that show a high percentage of Aegean imports, at least for part of the periods LH IIIB and IIIC.[16] Torre Santa Sabina offers an interesting case, as the material comes from RBA 2 habitation structures,[17] and the Aegean pots may best be dated to LH IIIC Early – thus being roughly contemporary with the Zambrone evidence. However, the quantity of Aegean-type pottery is rather restricted and not all of it comes from closed stratigraphic contexts.[18] The early excavations at Scoglio del Tonno brought to light one of the largest assemblages of Aegean-type

11 Four vessels out of 44 (Jung et al. 2015a, 459, fig. 2).

12 According to Peroni's territorial model (Peroni 1994, 840–841, fig. 227; 850–851, fig. 229).

13 Vagnetti – Panichelli 1994; Vagnetti 2001a.

14 The typologically most recent pots from both the rampart layers at Torre Mordillo and from the Central Hut at Broglio di Trebisacce date to LH IIIC Advanced (Jung 2006a, 104–137), while the latest Mycenaean pots from the fortification ditch at Punta di Zambrone fall into LH IIIC Early (Jung et al. 2015b, 68–79).

15 Jones et al. 2014b, 411–413, fig. 6.3.

16 Jones et al. 2014b, 411–413, fig. 6.3.

17 Cinquepalmi – Coppola 1998.

18 13 Aegean-type fragments from the settlement and one from tomb 5 have been analysed and are listed by Jones and Levi (Jones – Levi 2014, 144). 23 sherds are published from the settlement, three from tombs 3 and 12 (Cinquepalmi – Coppola 1998).

pottery in southern Italy. Elizabeth Fisher catalogued 205 vessels and sherds and estimated that another 100–200 sherds should be added.[19] 48 pieces from Scoglio del Tonno were analysed by Richard Jones using different analytical techniques. Unfortunately, no contextual information is available for these finds, which are mainly of Palatial and Post-palatial date (LH IIIA Late – LH IIIC). According to the interpretation of the data by Jones and Levi, imports clearly dominate over local/regional products.[20] However, the repertoire differs from the one attested at Punta di Zambrone in several respects including date[21] and type frequencies.[22]

Under these conditions Roca Vecchia seemed to be the most promising site to execute more chemical analyses on Aegean and Aegeanising ceramics by using NAA, in order to produce new data that are compatible with those from Punta di Zambrone and could serve to test the above-mentioned hypotheses. The ongoing excavations of Roca Vecchia offer the best conditions for such an endeavour, first because of the long vertical stratigraphic sequence and second because of the huge quantities of Aegean-type pottery finds recovered in closed stratigraphic contexts.[23] Third, previous chemical analyses by Jones using ICP have already suggested the existence of a high percentage of Aegean imports, especially among late Palatial and early Post-palatial products.[24]

On this basis, our project was designed to pose some specific questions rather than seeking to reconstruct the full range of Aegean pottery production and consumption at Roca Vecchia. We wanted to focus on the late Palatial and early Post-palatial period, later LH IIIB and LH IIIC Early, the same time period to which the Aegean-type pots from Punta di Zambrone are dated (represented at Roca Vecchia by the two earliest stratigraphic phases of the RBA). For analysis we have selected vessels that resemble those found at Punta di Zambrone on the basis of both type and style as well as macroscopic fabric criteria. Here, we preferred types that are attested at both sites with several specimens and can be taken as representative for the period. In addition, we sampled vessels that are characteristic for Roca Vecchia itself, both in terms of type (specific types with restricted geographical distribution in southern Italy: RocV 5 and 8 and perhaps also RocV 19) and in terms of fabric (RocV 5, 6, 8, 11, 12, 16 and 20). This twofold strategy should allow us to find (1) pots produced in the same Aegean workshops and then exported to Roca Vecchia and Punta di Zambrone, respectively, and (2) to identify possible exports from the Salento region to southern Calabria.

Results of the Chemical Analyses

The 20 vessels selected, including the 8 pieces characteristic for Roca Vecchia, were analysed in Bonn using the routine Neutron Activation Analysis (NAA) procedure as described before,[25] and recently in Jung et al. 2015a. Tab. 1 gives the list and description of these samples. The results, if 20 samples are considered to be meaningful, oppose the findings for the site of Punta di Zambrone. Here the locally made, i.e. in southern Italy, Italo-Mycenaean vessels prevail: 8 out

19 Fisher 1988, 26, 206–251, figs. 4–32. However, only a complete study of all the finds from Scoglio del Tonno kept at the National Archaeological Museum of Taranto may clarify the matter.

20 Jones – Levi 2014, 154–162. One should note that some of the analysed fragments seem to post-date the Bronze Age (Jung 2016, 285).

21 Many vessels date to LH IIIA Late and LH IIIB Early–Middle and are thus earlier than the finds from Punta di Zambrone.

22 In general there are more types attested at Scoglio del Tonno than at Punta di Zambrone, which may only partly be explained by the higher degree of fragmentation of the Zambrone finds (cf. the statistics by Bettelli 2002, 63, fig. 15; 65, fig. 16).

23 See Guglielmino, this volume.

24 Of 35 analysed Aegean or Aegeanising vessels, 18 were classed as imports (mainly assigned to the northern Peloponnese as well as western and central Crete), while 17 were interpreted as local or probably local/regional (Jones – Levi 2014, 146–149, 258–260, 271).

25 Mommsen et al. 1991.

of the 20 pieces from Roca Vecchia belong to a new group temporarily named X115, assigned with high probability to the region of southeastern Italy (Salento), maybe even to workshops close to Roca Vecchia, since group X115 comprises exclusively samples from Roca Vecchia, while kiln wasters from L'Amastuola,[26] close to Taranto, are members of a group named TaIA and this group is not very different in composition to group X115 (with slightly lower values in Hf and Zn and higher values in Fe, if multiplied with the best relative fit factor of 0.93 with respect to TaIA). In addition, a new group, X116, with only 4 samples from Roca Vecchia could be formed, which is close in composition to group X115 except for lower K and Rb values (best relative fit factor 0.99 for X116 with respect to X115), a deviation encountered frequently before.[27] Like X115, it is of still unknown origin, but these 4 pieces were certainly also made at or somewhere in the region of the X115 workshops. A further vessel shows composition SybB, assigned to workshops in the southern Sybaritic plain.[28] This increases the number of southern Italian vessels out of 20 to 13, more than 50%. Only 5 vessels were imported from Greece: 3 from the Western Peloponnese (Achaea, Elis); 1 probably from Arcadia, a member of group Ul54 assigned to the site Asea there,[29] and 1 probably from Boeotia, group X120. The raw concentration data of the 20 samples are given in Tab. 2 and Tab. 3 lists the average concentration values of the groups mentioned. The concentration patterns of groups Ul54 and OlyA were published recently.[30]

Sample no.	Area and Stratigraphical Unit	Area and Stratigraphical Phase	Type	Linear Decoration	Motif	Color of Paint	Chemical Group [fit factor]
RocV 1	SAS IX: 11352, 11350, 9298, 10307	Area IX, Phase I	deep bowl FT 284/285	11.0	0	dark	singleton
RocV 2	SAS IX: 11349	Area IX, Phase II	krater FT 281/282	1 lower band, 2 interior bands	panelled pattern FM 75 or tricurved arch FM 62 with vertical chevrons FM 58	dark	X116 (close to X115) [1.00]
RocV 3	SAS X: 4082	Area X, Phase V	deep bowl FT 284/285	11.0	0	dark	X120 (Boeotia) [0.81]
RocV 4	SAS IX: 11379, 11349	Area IX, Phase I	deep bowl FT 284/285	9.3/16 + 2 lower bands	horizontal zigzag FM 61 in added white paint	dark	OlyA (Achaea/ Elis) [0.97]
RocV 5	SAS IX: 11718, 11331, 9287, 9247, 3324	Area IX, Phase V	Italo-Mycenaean open vessel	exterior rim band 2.1, 1 lower band	pannelled pattern FM 75 and isolated semicircles FM 43	red	X115 [0.94]
RocV 6	SAS IX: 11553	Area IX, Phase II	deep bowl FT 284/285	9.1	0	red	X115 [1.18]
RocV 7	SAS IX: 11349, 11348, 11347, 11093	Area IX, Phase II	neck-handled amphora FT 67	exterior band below rim 2.1, lower interior band 2.1, belly band 2.3, lower bands 2.3	spiraliform motif (cf. FM 49), joining semicircles FM 42	dark	X115 [1.03]

[26] Geißler et al. forthcoming.
[27] See e.g. Mountjoy – Mommsen 2001.
[28] Jung et al. 2015a.
[29] Forsén et al. 2017.
[30] Ul54: Forsén et al. 2017; OlyA: Jung et al. 2015a; Mommsen et al. 2016.

Sample no.	Area and Stratigraphical Unit	Area and Stratigraphical Phase	Type	Linear Decoration	Motif	Color of Paint	Chemical Group [fit factor]
RocV 8	SAS IX: 11379, 11349, 10306, 9850, 9276, 11245, 9630, 11347, 11346, 10990, 11718	Area IX, Phase I	Italo-Aegean hydria	1.2 + band 7.1 around neck attachment, shoulder bands 2.3, lower bands 2.3, 2 lower bands	linked whorl-shell pattern FM 24	dark	X115 [1.07]
RocV 9	SAS IX: 11379, 11349, 9298, 9961	Area IX, Phase I	deep bowl FT 284/285	11.0	0	dark	Ul54 (with further members from Asea, Arcadia) [0.95]
RocV 10	SAS IX: 11349, 11408, 12277	Area IX, Phase II	krater FT 281/282	3 broad lower bands, 1 broad interior band	triglyph-like palm trees FM 15 or hybrid flowers FM 18	dark	X115 [0.91]
RocV 11	SAS IX: 11349, 10939	Area IX, Phase II	deep bowl FT 284/285	16 + lower band 2.1	multiple stems FM 19,37/38	dark	X116 (close to X115) [1.01]
RocV 12	SAS IX: 11349, 10768, 11347, 11084, 10306, 9295	Area IX, Phase II	krater FT 281/282	1.3	panelled pattern FM 75 with antithetic loops FM 50	red	X115 [1.01]
RocV 13	SAS IX: 11349, 11347	Area IX, Phase II	large closed vessel	belly bands 2.3, 2 broad lower bands	0	dark and red	not measured
RocV 14	SAS IX: 11349	Area IX, Phase II	deep bowl FT 284/285	5.1	panelled pattern FM 75	dark	X116 (close to X115) [1.09]
RocV 15	SAS IX: 11379, 11349, 11718	Area IX, Phase I	stirrup jar	2 bands across false neck	0	red	not measured
RocV 16	SAS IX: 11349	Area IX, Phase II	closed vessel	3 bands on neck-shoulder junction, 1 broad belly band	multiple stems FM 19,37/38	dark	X116 (close to X115) [0.91]
RocV 17	SAS IX: 11379	Area IX, Phase I	mug FT 226	belly bands 2.2, base decoration 3.2	curved stripes FM 67?	red and dark	OlyA (Achaea/ Elis) [0.89]
RocV 18	SAS IX: 11341	Area IX, Phase V	pithos	0	0	unpainted	SybB [0.87]
RocV 19	SAS IX: 10762	Area IX, phase uncertain	Italo-Mycenaean carinated bowl	15	broad wavy line FM 53,25	red	X115 [0.92]
RocV 20	SAS IX: 11379, 10306, 11349, 11675, 11289, 11718, 9276, 9630, 9250	Area IX, Phase I	krater FT 281/282	1.3	panneled pattern FM 75 and isolated semicircles FM 43	red	X115 [0.97]
RocV 21	SAS IX: 11379, 11349, 11408, 10306	Area IX, Phase I	Italo-Mycenaean large closed vessel	belly bands 2.3	curvolinear pattern	dark	singleton
RocV 22	SAS IX: 11379, 11408, 11763, 11349,9276, 5741	Area IX, Phase I	jug FT 105 or hydria FT 128	0	0	unpainted	OlyA (Achaea/ Elis) [1.22]

Tab. 1 Analysed samples from Roca Vecchia: wheelmade Mycenaean and Mycenaeanising pottery (for the decoration codes cf. Jung 2002, 575–580); one pithos

Sample	As	Ba	Ca%	Ce	Co	Cr	Cs	Eu	Fe%	Ga
RocV 1	6.94	486.	9.21	65.3	30.0	248.	7.39	1.28	4.59	20.9
RocV 2	15.5	472.	8.61	58.5	13.2	154.	6.17	0.98	3.44	12.0
RocV 3	4.48	483.	2.80	63.6	36.6	636.	5.86	1.24	5.01	19.2
RocV 4	8.02	453.	8.34	66.4	28.4	246.	7.78	1.34	5.43	25.9
RocV 5	23.3	362.	11.3	60.6	14.3	138.	5.67	1.04	3.45	15.3
RocV 6	9.41	421.	12.2	48.6	9.91	115.	4.43	0.85	2.68	18.2
RocV 7	11.5	409.	8.95	56.5	10.5	98.8	5.23	1.06	2.97	11.2
RocV 8	13.6	436.	11.9	52.6	11.6	130.	4.93	0.97	3.08	–
RocV 9	6.19	363.	9.23	57.7	30.9	257.	5.28	1.06	4.68	19.2
RocV 10	6.76	450.	9.87	63.3	14.1	176.	5.65	1.18	3.47	14.2
RocV 11	17.5	560.	13.2	60.9	11.6	137.	5.85	1.01	3.25	16.2
RocV 12	14.8	562.	12.1	55.0	13.4	135.	5.52	0.98	3.18	17.4
RocV 14	14.7	525.	16.0	50.7	11.4	143.	5.09	0.87	2.87	10.5
RocV 16	10.00	524.	11.5	68.8	14.3	164.	6.75	1.18	3.90	18.3
RocV 17	4.69	438.	4.46	75.6	32.5	282.	7.92	1.28	5.46	22.9
RocV 18	4.15	535.	6.56	85.8	19.0	124.	9.26	1.32	4.83	28.0
RocV 19	5.03	436.	10.8	62.4	20.9	125.	6.11	1.07	3.57	20.8
RocV 20	13.7	634.	10.9	58.0	15.2	143.	5.91	0.99	3.33	21.5
RocV 21	6.48	434.	8.38	66.1	14.4	211.	6.59	1.01	3.66	16.0
RocV 22	4.45	342.	8.77	52.1	24.7	214.	6.07	0.96	4.32	13.5
ave. error	0.14	43.	0.28	0.49	0.15	1.0	0.12	0.024	0.014	2.4
in%	1.4	9.2	2.8	0.8	0.8	0.5	1.9	2.2	0.4	13.

Sample	Hf	K%	La	Lu	Na%	Nd	Ni	Rb	Sb	Sc
RocV 1	4.30	2.14	31.5	0.41	0.75	28.8	175.	127.	1.30	18.0
RocV 2	4.52	1.34	28.2	0.33	1.57	23.1	113.	95.5	0.48	13.3
RocV 3	6.20	1.91	31.1	0.47	1.21	27.9	306.	116.	0.76	18.6
RocV 4	3.78	2.64	31.9	0.43	0.83	19.1	276.	162.	0.62	23.0
RocV 5	5.02	1.87	29.3	0.39	1.08	24.6	114.	115.	0.86	12.9
RocV 6	3.93	1.54	23.8	0.30	0.94	17.5	119.	97.3	0.44	10.6
RocV 7	3.98	1.80	27.3	0.34	0.79	25.3	62.6	105.	0.36	12.2
RocV 8	4.46	1.62	25.3	0.30	0.85	18.5	118.	106.	0.52	11.9
RocV 9	3.56	1.60	27.8	0.39	1.32	24.4	239.	101.	0.84	19.1
RocV 10	4.85	1.93	31.7	0.37	1.39	24.0	135.	113.	0.41	13.3
RocV 11	4.94	1.09	30.2	0.35	1.32	22.3	138.	85.8	0.68	12.0
RocV 12	4.38	1.81	26.5	0.33	0.96	20.6	123.	115.	0.65	12.4
RocV 14	4.65	1.11	25.4	0.32	1.22	18.5	102.	87.4	0.54	11.2
RocV 16	5.36	1.43	33.4	0.37	1.54	22.8	146.	81.0	0.59	14.7
RocV 17	5.13	2.68	36.3	0.49	1.00	27.3	227.	156.	0.59	21.5
RocV 18	5.47	3.12	42.7	0.47	1.07	31.8	96.8	161.	1.03	19.1

Sample	Hf	K%	La	Lu	Na%	Nd	Ni	Rb	Sb	Sc
RocV 19	4.16	2.06	30.6	0.35	0.78	26.3	118.	136.	0.39	14.0
RocV 20	4.25	1.86	27.9	0.35	0.99	20.7	103.	118.	0.65	12.9
RocV 21	5.25	2.06	31.9	0.30	1.15	27.5	114.	129.	0.47	13.2
RocV 22	3.75	2.06	25.5	0.35	0.85	20.0	215.	123.	0.32	17.1
ave. error	0.066	0.030	0.099	0.013	0.007	2.9	33.	2.9	0.035	0.023
in%	1.4	1.6	0.3	3.6	0.6	12.	22.	2.5	5.7	0.2

Sample	Sm	Ta	Tb	Th	U	W	Yb	Zn	Zr	
RocV 1	5.54	0.87	0.74	10.3	5.21	1.41	2.85	134.	230.	
RocV 2	4.04	0.89	0.60	9.67	3.73	2.20	2.41	69.8	161.	
RocV 3	5.19	0.90	0.79	10.5	2.21	2.35	3.26	117.	246.	
RocV 4	5.14	0.74	0.85	11.4	2.01	2.40	2.87	109.	170.	
RocV 5	4.40	0.78	0.71	10.1	3.33	2.06	2.69	115.	190.	
RocV 6	3.37	0.67	0.60	7.86	2.50	1.68	2.13	74.5	165.	
RocV 7	4.20	0.85	0.65	8.94	2.01	2.41	2.36	84.0	165.	
RocV 8	3.71	0.81	0.63	8.73	3.04	1.87	2.19	104.	184.	
RocV 9	4.24	0.64	0.79	9.21	1.96	2.03	2.67	121.	154.	
RocV 10	5.14	0.88	0.79	10.7	2.86	1.58	2.79	144.	185.	
RocV 11	4.54	0.93	0.69	10.2	2.80	1.29	2.50	73.1	177.	
RocV 12	3.85	0.87	0.66	9.07	3.32	2.08	2.48	105.	170.	
RocV 14	3.63	0.88	0.68	8.83	2.16	1.48	2.24	75.8	158.	
RocV 16	5.12	1.08	0.74	11.1	3.48	1.68	2.77	89.2	232.	
RocV 17	5.36	1.13	0.80	12.6	2.75	2.55	3.18	119.	238.	
RocV 18	5.91	1.36	0.87	14.1	4.79	2.08	3.40	141.	175.	
RocV 19	4.24	0.90	0.68	10.4	3.15	1.78	2.28	118.	157.	
RocV 20	4.24	0.93	0.67	9.49	3.19	2.12	2.34	106.	162.	
RocV 21	4.82	0.96	0.57	11.5	2.19	1.62	2.06	73.2	215.	
RocV 22	3.98	0.61	0.60	8.64	1.90	1.51	2.37	73.7	174.	
ave. error	0.051	0.053	0.059	0.078	0.25	0.20	0.068	2.6	23.	
in%	1.1	6.0	8.5	0.8	8.4	10.	2.6	2.5	13.	

Tab. 2 Raw data of the 20 samples from sherds found at Roca Vecchia. Given are the concentrations C of 29 elements in µg/g (ppm), if not indicated otherwise, and below, the average experimental uncertainties (errors), also in % of C

	TaIA 34 samples factor 1.00		X115 8 samples factor 0.93		X116 4 samples factor 0.95		SybB 51 samples factor 1.20		X120 11 samples factor 1.00	
	M	σ(%)	M	σ(%)	M	σ(%)	M	σ(%)	M	σ(%)
As	10.5	(32.)	11.4	(44.)	13.8	(26.)	10.8	(69.)	8.40	(64.)
Ba	429.	(21.)	433.	(19.)	486.	(11.)	791.	(56.)	374.	(46.)
Ca\%	11.4	(17.)	10.3	(17.)	11.8	(31.)	8.55	(33.)	5.44	(51.)
Ce	61.1	(1.9)	53.0	(1.5)	56.5	(5.6)	94.5	(4.5)	54.5	(3.6)
Co	15.2	(11.)	12.6	(19.)	11.9	(5.1)	19.0	(7.5)	29.7	(13.)
Cr	145.	(10.)	123.	(13.)	142.	(5.0)	131.	(7.2)	474.	(13.)
Cs	5.89	(5.7)	5.03	(4.1)	5.65	(4.8)	8.10	(9.2)	3.74	(15.)
Eu	1.10	(2.0)	0.95	(4.5)	0.96	(5.1)	1.57	(4.5)	1.03	(3.2)
Fe\%	3.82	(4.9)	2.98	(2.5)	3.18	(5.5)	5.41	(5.0)	4.39	(6.3)
Ga	18.2	(15.)	15.4	(21.)	14.3	(18.)	27.5	(17.)	15.3	(9.8)
Hf	3.87	(5.5)	4.07	(7.5)	4.62	(4.9)	5.90	(6.7)	4.72	(7.8)
K\%	1.94	(3.8)	1.68	(3.1)	1.17	(8.4)	2.95	(10.)	1.61	(13.)
La	29.9	(1.5)	25.8	(2.6)	27.7	(5.2)	45.5	(4.1)	25.5	(4.0)
Lu	0.37	(3.6)	0.32	(4.7)	0.33	(3.4)	0.51	(4.1)	0.38	(3.8)
Na\%	0.76	(12.)	0.90	(17.)	1.34	(7.8)	1.03	(17.)	0.85	(40.)
Nd	26.2	(6.1)	20.5	(12.)	20.7	(13.)	39.2	(6.2)	22.1	(6.2)
Ni	134.	(19.)	101.	(25.)	121.	(23.)	100.	(35.)	357.	(20.)
Rb	113.	(5.1)	105.	(5.9)	83.2	(12.)	159.	(7.1)	81.0	(6.5)
Sb	0.49	(20.)	0.50	(30.)	0.54	(16.)	0.77	(25.)	0.57	(27.)
Sc	14.3	(3.8)	11.6	(2.2)	12.1	(5.1)	19.3	(3.1)	16.2	(6.2)
Sm	4.90	(3.0)	3.84	(6.4)	4.09	(8.6)	7.16	(3.9)	4.26	(3.6)
Ta	0.88	(5.2)	0.78	(6.8)	0.90	(5.1)	1.42	(7.2)	0.76	(4.4)
Tb	0.67	(6.7)	0.63	(7.6)	0.65	(8.0)	0.95	(6.9)	0.64	(8.5)
Th	9.80	(1.9)	8.71	(2.2)	9.42	(3.5)	15.5	(4.4)	8.76	(5.5)
U	2.62	(14.)	2.70	(15.)	2.88	(19.)	3.40	(15.)	1.62	(7.8)
W	2.26	(16.)	1.80	(16.)	1.54	(22.)	2.92	(16.)	1.66	(12.)
Yb	2.45	(2.3)	2.23	(6.3)	2.35	(2.6)	3.46	(3.2)	2.51	(3.2)
Zn	90.7	(7.4)	97.9	(13.)	72.9	(7.5)	140.	(13.)	88.9	(8.7)
Zr	165.	(14.)	161.	(12.)	174.	(12.)	213.	(23.)	179.	(16.)

Tab. 3 Average concentrations M and spreads (root mean square deviations = standard deviations) σ of the formed groups: TaIA: region of L'Amastuola/Taranto, X115 and X116: unknown, probably Salento, SybB: southern Sybaritic plane, X120: unknown, probably Boeotia. The groups X115, X116, and SybB are multiplied with the best relative fit factor with respect to the group TaIA

These provenance determinations contradict the results of Jones and Levi for the same site of Roca Vecchia.[31] They report a large contingent of about 50% of Aegean imports, whereas in our set of 20 samples only 25% were imported from Greece and the local 'Italo-Mycenaean' wares contribute 65%.[32] The case of Punta di Zambrone, with the high percentage of Aegean imports, is a peculiar, so far rare, result among southern Italian settlements. We can exclude having missed local products in the extensive sampling strategies, in which only very small pieces were not sampled.

[31] See n. 24.

[32] Note, however, that the analysis programme by Jones and Levi also included samples from earlier as well as later stratigraphic phases. Our project focused on the earliest levels of the Recent Bronze Age, in order to collect evidence contemporaneous with that of Punta di Zambrone (see above).

A preliminary assessment of fabric groups at Roca conducted by Iacono has allowed us to identify two main (read 'typical') groups within the Roca material. These have been identified as 'local' on the basis of Jones and Levi's analyses,[33] but their definition was not purely visual/macroscopic, as it was aided by the analysis of about 100 vessels/sherds through p-XRF. The two groups can be briefly characterised as one rich in Iron and another rich in Calcium. This is not unusual in sets of lustrous decorated pottery, but the overlap of some of the members of the groups with local southern Italian productions identified by means of NAA is extremely interesting. The Fe-rich samples had reddish paint, pink to brownish fabric and were often micaceous and slightly softer. The Ca-rich group, on the other hand, usually had a dark brown to black paint, cream to buff fabric, was normally harder than the iron-rich material, and almost always non-micaceous. Within the sample from Roca Vecchia the samples RocV 5, 6, 12, 20 (all belonging to X115) can be put under the Fe-rich 'label' and RocV 8, 11, and 16 in the Ca-rich one (which possibly overlaps with X116) (but compare Tab. 3 for the NAA concentration results).

Detailed Discussion of the Results with Reference to Single Vessels

Imports from Greece

Two of the analysed monochrome deep bowls FT 284/285 (RocV 1 and RocV 9[34]), both found in early RBA 2 layers (area SAS IX, Phase I), show the everted rim that is found on monochrome deep bowls from the last phase of the Pylos palace, the destruction level dated to LH IIIC Early 1.[35] The first of these deep bowls from Roca turned out to be a singleton (RocV 1), while the second one originated in Arcadia,[36] central Peloponnese (RocV 9). The same morphological variety of the monochrome deep bowl is represented with three specimens in the RBA 2 ashy fill layers in the fortification ditch at Punta di Zambrone.[37] Two of them were produced in western Greece (chemical group OlyA from Achaea or Elis), while the third one also seems to be a Peloponnesian product.[38] These analytical results prove that the monochrome deep bowl with everted rim was produced in several areas of the Peloponnese. They furthermore suggest that such products may have reached southern Italy via different routes at the beginning of LH IIIC Early.

The third deep bowl FT 284/285 with monochrome decoration is also an import, but unlike RocV 9 it was not produced in the Peloponnese. The NAA result indicates a probable Boeotian workshop (RocV 3, Fig. 1.RocV 3). The rim of this deep bowl is flaring, the painted decoration partially diluted with clearly visible brush traces. These characteristics hint at a later production period than that of the first two monochrome deep bowls (RocV 1 and 9), and, in fact, the stratigraphic context of RocV 3 belongs to the last Bronze Age settlement phase (area SAS X, Phase V) dating to Final Bronze Age 2 (FBA 2).

Two sampled sherds (RocV 4, Fig. 1.RocV 4, and RocV 11) belong to deep bowls FT 284/285 of type C according to Kardamaki, a decoration type (decoration 16, with rim band between 1.5 and 2.49cm of width) that was common in both LH IIIB Final and IIIC Early.[39] The first sampled specimen (RocV 4) is a Peloponnesian import according to the NAA results. It shows an everted rim similar to that of the two monochrome deep bowls, but even more articulated than in the

[33] Jones – Levi 2014, 146–149, 258–260, 271.

[34] Guglielmino, this volume, fig. 2.3 (RocV 1), 4 (RocV 4).

[35] Blegen – Rawson 1966, 110, 189–190, 308, 398, figs. 385.594, 1172, 1176; 386.594; Mountjoy 1999, 352, cat. nos. 116 and 117, fig. 110.117. For the discussion of these parallels see: Guglielmino 2009a, 191, 193, fig. 3.1, 2. – For the date of the palace destruction see: Vitale 2006, 200, tab. 2.

[36] Forsén et al. 2017.

[37] Jung et al. 2015b, 69–70, fig. 13.4; 95–96, cat. no. 4.

[38] Jung et al. 2015a, 458, tab. 1: sample nos. Zamb 1, 39 and 40.

[39] Kardamaki 2009, 204–206, 228–231. However, the rim band of RocV4 bifurcates, which leads to the decoration type 9.3.

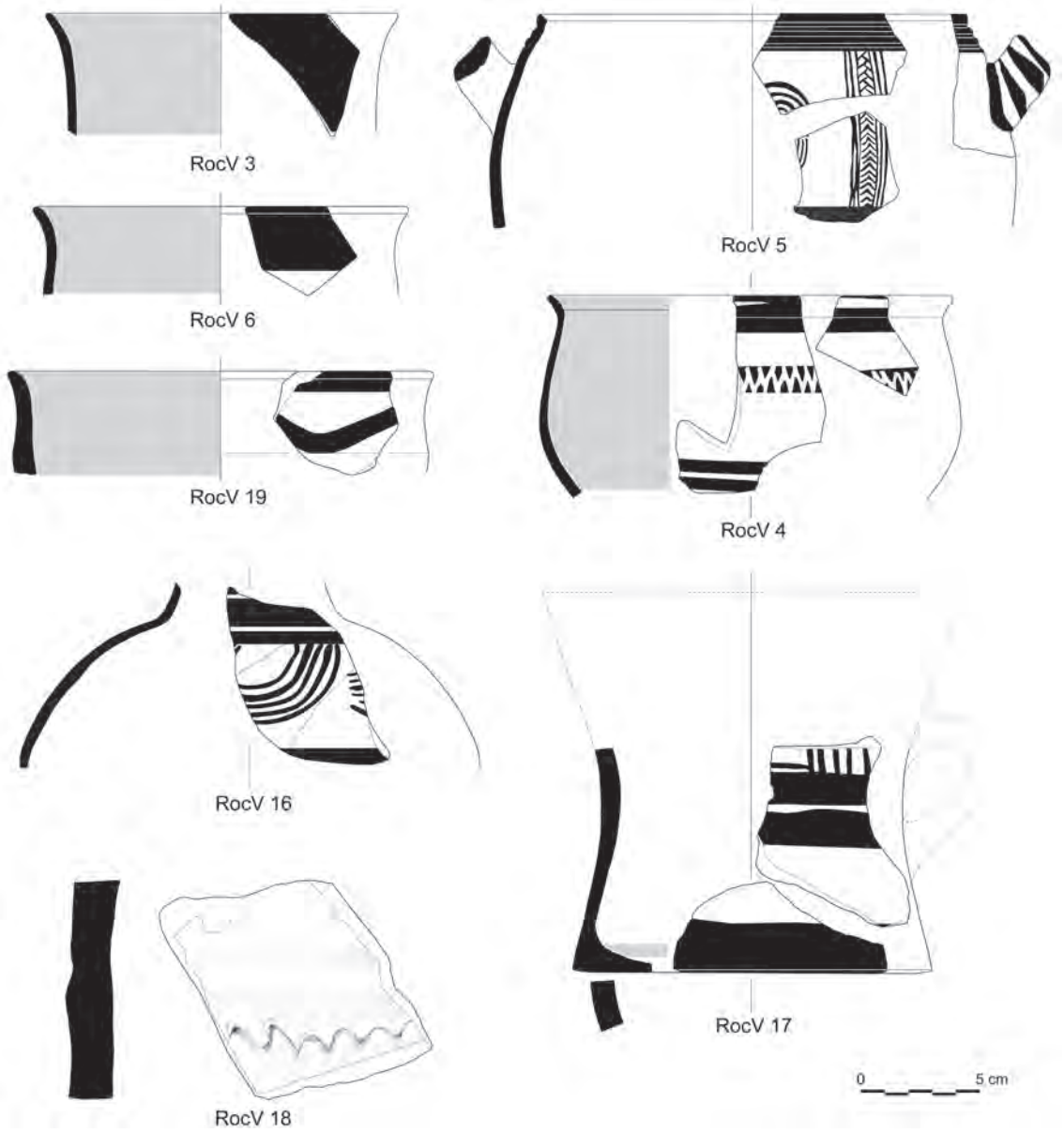

Fig. 1 Mycenaean and Mycenaeanising vessels and one pithos (RocV 18) from Roca Vecchia, analysed with NAA. Scale 1:3 (drawings: R. Guglielmino, L. Coluccia and F. Iacono)

monochrome specimens. It was found in the same early RBA 2 layers as two of the mentioned monochrome deep bowls. Its most characteristic feature is the horizontal zig-zag executed in added white paint on top of a horizontal band in the decorative zone. The rare light-on-dark technique finds several parallels in Post-palatial Greece. In our case the most significant ones are deep bowls from Teichos Dymaion on Cape Araxos in western Achaea,[40] because the NAA result indicates a production place in this region or in Elis, immediately to the south (chemical group OlyA). Added white paint was also used in the Voúdeni workshop, a western Achaean workshop active in the middle of LH IIIC and known for its pictorial products.[41] Published examples from Voúdeni itself include a monochrome krater FT 281/282 with pictorial decoration in the reserved handle zone (white paint on the animal bodies), a monochrome kalathos FT 290/291 with added white zigzag

40 Mastrokostas 1966, 64, pl. 61α; Mastrokostas 1967a, pl. 165.9.
41 Moschos 2009a, 360–361; Moschos 2009b, 257 n. 171.

bands and dotted lines below the reserved handle zone, and three fragments of pictorial kraters with warriors, rowers and birds.[42]

A further vessel produced in the Peloponnese and exported to Roca Vecchia during the first RBA 2 phase (area SAS IX, phase I) is a mug, FT 226 (RocV 17, Fig. 1.RocV 17). Again the chemical group OlyA indicates an Elian or Achaean workshop. Due to the rarity of settlement excavations in these northwestern Peloponnesian regions, few specimens are published. There is one parallel for the combination of shape and motif (curved stripes FM 67) from chamber tomb 15 in the Trípes cemetery at Kladhéos.[43]

Surprisingly, another Peloponnesian import found in the same early RBA 2 layers as most of the analysed deep bowls (Area SAS IX, Phase I) is an unpainted pot (RocV 22[44]). It is a large one-handled closed vessel, either a jug FT 105 or a hydria FT 128.[45] Unpainted Mycenaean vessels are a rarity in southern Italy. Two rather small wall fragments from the fortification ditch of Punta di Zambrone come from a large jug (FT 105) or a neck-handled amphora (FT 70) and from a belly-handled amphora (FT 58) or a hydria (FT 128) respectively.[46] Both were probably entirely unpainted vessels, but the fragmentary preservation prevents a 100% certain classification. In all three cases (RocV 22, Zamb 32, Zamb 38) the NAA shows that we are dealing with imports from the northwestern Peloponnese, i.e. from Achaea or Elis (chemical group OlyA). The fact that only very few settlement finds are published from these regions impedes the search for parallels, but one can cite a hydria found at Dhrakótripa in western Achaea.[47]

Apulian Products

Based on the assignation of chemical groups X115 and X116 to workshops located in Apulia, we can confirm the above-mentioned existence of two pot making traditions, a first one that includes Mycenaean-type products and a second one, the products of which are Aegeanising and combine typological and stylistic traits of different provenance.

Eight vessels of the analysed sample are local products of Mycenaean type. A deep bowl FT 284/285 of type A with the rim decoration 5.1 characteristic for this type[48] is decorated with a triglyph motif FM 75 consisting of a central net pattern FM 57 and lateral arrows (RocV 14, from SAS IX, Phase II, early in RBA 2).[49] One deep bowl A from a LH IIIB layer at Thebes shows a triglyph with the same combination of motif elements.[50] In general, arrows as a fringe motif of triglyphs on deep bowls A are attested in LH IIIB Middle at Mycenae[51] as well as in LH IIIB Final

42 Kolonas 2008, 16–17, fig. 18; 19, fig. 23; I. Moschos in: Badisches Landesmuseum Karlsruhe 2018, 356, cat. no. 297; 362–363, cat. nos. 311–313. Two krateriskoi and two spouted kraters FT 298 from Delphi and Kirrha in Phocis show decorations with an outer band carrying quirk motifs FM 48 in added white paint similar to the deep bowl from Roca Vecchia, but the vessels from Phocis are much larger (Mountjoy 1999, 759–762, fig. 295.743).

43 O. Vikatou in: Heilmeyer et al. 2012, 325, cat. no. 106. The horizontal line starting to the left of the motif might suggest a classification of the motif as a panelled pattern FM 75.5/75.18, but that regularly has wavy lines rather than straight lines as central fill elements (cf. Voigtländer 2003, pl. 99.S115; 100.S197; 104.HS12–20; 107.HS54–63; 121.Si4–8; 122.Si9–17 [the latter perhaps an exception with straight lines]). Furthermore, curved stripes are more common on mugs than panelled patterns. Therefore, the horizontal straight line might be an irregularity of the lower band bordering the motif at the bottom.

44 Guglielmino, this volume, fig. 5.1.

45 Guglielmino 2013, 149, 279, fig. 105.

46 Jung et al. 2015a, 458, tab. 1, samples Zamb 32 and Zamb 38; Jung et al. 2015b, 73, fig. 14.17; 98, cat. no. 28.

47 Zapheiropoulos 1965, 169, 175, cat. no. 4, pl. 136β; Papadopoulos 1978/1979, 105, 216, cat. no. 734, pl. 147, fig. 171a, pl. 238, fig. 262a.

48 Podzuweit 2007, 24, Beil. 1.

49 Iacono 2015, 268–269, fig. 4; Guglielmino, this volume, fig. 2.9.

50 Thebes, Oedipus Street 14, Room B, beneath the floor: Symeonoglou 1973, 20, pl. 24, fig. 35.14. The only difference is the rim decoration, as the Boeotian deep bowl shows decoration 1.1.

51 South House, construction fill: Mountjoy 1976, 89, fig. 7.51. Prehistoric Cemetery, Central: French 1966, 232–233, fig. 8.22–23. For a further specimen from Mycenae see Iakovidis 2013b, 257, pl. 56α6.

at Tiryns[52] and Thebes.[53] Further examples come from Kopréza in Attica[54] and Áyios Stéphanos in Laconia.[55] The sherd from Roca Vecchia belongs to chemical group X116, which most probably represents regional products, but is the smaller of the two identified groups that can be ascribed to Apulia. No typological or stylistic element of this fragment diverges from the pottery making traditions of Late Mycenaean Greece.

A further deep bowl fragment belongs to FT 284/285 type B (RocV 6, Fig. 1.RocV 6). In the Argive sequences this type with its monochrome interior decoration and the rim band of 2.5–3cm width is characteristic for the last phases of the Palatial period, i.e. LH IIIB Developed and Final, while it is already a rare type by LH IIIC Early 1.[56] The stratigraphic context of the sampled specimen from Roca Vecchia indicates a rather early stage of RBA 2 (Area SAS IX, Phase II). The vessel is a member of the larger chemical group of Apulian origin, group X115. One may wonder if this is a case of secondary deposition of a 13th-century product – considering also the size of the fragment and its partially worn surface.

One of two analysed deep bowls FT 284/285 of type C is a locally made Mycenaean pot belonging to the same chemical group X115 (RocV 11) as the deep bowl B. Deep bowl C RocV 11 has the s-profile characteristic of Post-palatial deep bowls on the Greek mainland, while the tongue-shaped multiple stem motif FM 19,37/38 is rather characteristic for the palace period.[57] This deep bowl was found in the second building phase of RBA 2 (Area SAS IX, Phase II), which rules out a LH IIIB date. Being a member of the small NAA group X116, it is an Apulian product, but in view of the fact that other vessels from the RBA 2 levels at Roca are imports from Achaea, a deep bowl from Teichos Dymaion seems to be a relevant parallel.[58] It was found inside the secret passageway of the citadel wall and shows the same motif (although in a more curved execution) and the same lower bands as the Apulian vessel, but it belongs to the deep bowl type A without monochrome interior. Its pottery context is LH IIIC Early 1 in date and therefore either contemporary or slightly later than that of RocV 11.[59]

The fragment of a krater FT 281/282 (RocV 2, Fig. 2.RocV 2) shows a banded interior and a motif which is either a panelled pattern FM 75 or – because of the diverging lateral lines – a tricurved arch FM 62 combined with vertical chevrons FM 58. In Greece, panelled patterns such as the one on the krater from Roca Vecchia are characteristic for deep bowls rather than for kraters,[60] while the panelled pattern is found on a krater from the *Epichosis* (West Wall) material from Tiryns and thus in LH IIIB Final (–LH IIIC Early 1).[61] A second fragmentary krater FT 281/282 shows antithetic loops flanking a central triglyph filled with a net pattern (RocV 12, Fig. 2.RocV 12). A very similar motif appears on a deep bowl FT 284/285 from the destruction level in the palace of Pylos (LH IIIC Early 1[62]). A third krater FT 281/282, apart from a triglyph, shows a concentric semicircle motif that is positioned on top of a horizontal line (RocV 20, Fig. 2.RocV

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52 Tiryns, Lower Citadel, Building III, LH IIIB Final destruction layer: Grossmann – Schäfer 1975, 74–75, fig. 21, pl. 51.99.

53 Pelopídhou Street, Linear B archive, Deposit 2b: Andrikou 2006, 72, cat. no. 155; 110, pl. 10.155; 140, pl. 40, fig. 51.155.

54 Mountjoy 1999, 551, fig. 200.251.

55 Mountjoy 2008, 318, fig. 6.12.3182.

56 Kardamaki 2009, 395, 399.

57 Guglielmino 2009a, 192–193, fig. 3.4; Guglielmino, this volume, fig. 2.6.

58 Mastrokostas 1967b, 159–160, fig. 187β; Papadopoulos 1978/1979, 112, 215, cat. no. 679, pl. 153, fig. 177b.

59 The profile of the Achaean deep bowl shows the straight upper part and slight carination of the lower part characteristic for type 3 of Mountjoy's LH IIIB2/IIIC Early transitional phase (Mountjoy 1999, 37). The other two deep bowls – one with regular triglyphs of type A, one with running spiral – and the krater FT 281/282 with linked running spirals argue in favour of a very early Post-palatial date (cf. Mastrokostas 1967b, 159–160, figs. 186–187). A further deep bowl A with motif FM 19,37/38 comes from Mine no. 3 at Thorikós in Attica, which is not a closed context (Mountjoy 1995, 207–208, fig. 6.67).

60 Voigtländer 2003, 85, cat. no. Si 1, pls. 60.Si1; 121.Si1.

61 Voigtländer 2003, 77, cat. no. K 20, pl. 114.K20.

62 Blegen – Rawson 1966, 398, figs. 339 (right) and 385.808; Mountjoy 1999, 351–352, fig. 120.111.

20). This arrangement of the motif seems to be without parallel in Mycenaean Greece, where in LH IIIB Final and IIIC Early concentric semicircles are regularly found flanking triglyphs, but in an antithetic arrangement, in which the one semicircle group is hanging from a rim band, the other standing on a lower band.[63] In view of the remarkable variability and freedom that potters had to create and combine motifs on kraters, especially during LH IIIC Early, one may not use the surprising motif combination on the Roca krater to classify this pot as Aegeanising and not as Mycenaean in style.

All three kraters belong to chemical group X115. One fragment of RocV 12 had already been analysed in the earlier programme by Jones, and was also classified as a local product.[64] One of the three local kraters comes from the lowest RBA 2 level (Area SAS IX, Phase I: RocV 20), while two were found stratified in levels of the following settlement phase of RBA 2 (Area SAS IX, Phase II: RocV 2 and RocV 12). They are thus contemporary or slightly more recent in date than the quoted Peloponnesian parallels.

Finally, a fourth krater fragment (FT 281/282) is also a member of the larger Apulian group X115 (RocV 10[65]) and comes from a rather early level of RBA 2 (Area SAS IX, Phase II). Its linear decoration with (at least) three broad bands framing the lower end of the motif zone and (at least) one broad interior band conforms to common decorative schemes of Mycenaean kraters,[66] but it is difficult to find close parallels for the motif, a series of triglyph-like palm trees FM 15 or hybrid flowers FM 18.

The shoulder fragment of a closed vessel belonging to group X116 shows a row of hook-shaped multiple stems FM 19,37/38 pending from a shoulder band beneath the monochrome neck (RocV 16, Fig. 1.RocV 16). This motif rarely appears on shoulders of Mycenaean closed vessels. A narrow-necked jug FT 120/121 or a jug with cutaway neck from a LH IIIB Final context at Mycenae provides a reasonable parallel.[67] Another fragment from a LH IIIB Final context shows a similar motif, but in this case with standing multiple stems.[68] The closed vessel RocV 16 was found in a context of developed RBA 2 (Area SAS IX, Phase II) and should therefore be of Post-palatial date. According to the NAA it is a member of the smaller Apulian group X116. It might be that a prolonged use of the Palatial Mycenaean style in the Apulian workshops of wheel-made pottery was the reason for the chronological distance to the named parallels.

The neck-handled amphora (RocV 7, Fig. 2.RocV 7) coming from a RBA 2 context (Area SAS IX, Phase II) and belonging to chemical group X115 might be assigned to the Mycenaean FT 67 characterised by a broad flaring neck, rounded lip and two vertical handles from neck to shoulder. Although its size (height: 23.5cm; rim diameter: 10cm) is only slightly bigger than that of known FT 67 specimens, its proportions and profile – especially the conical lower body – are rarely paralleled among vessels found in Greece. The cemetery of Prósimna in the Argolid offers the best morphological comparison for the high shoulder and conical lower body, as opposed to the more baggy or rounded specimens quoted by Furumark, most of which are unpainted.[69] In addition, the Prósimna vessel also resembles the Roca Vecchia specimen as regards the neck decoration with

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63 Midea, West Gate (LH IIIB Final): Demakopoulou et al. 2008, 20, fig. 36. Menelaion, Profitis Elis erosion gully (LH IIIB Final – IIIC Early): Catling 2009, 171, cat. no. PE 39; fig. 228.PE 39. Tiryns, Northeastern Lower Town, Phase 1 (LH IIIC Early): Stockhammer 2007 vol. II, 19 cat. no. 248, pl. 13.248.

64 Guglielmino et al. 2010, 258, tab. 1.101; 263, tab. 3 (cluster 2); 275–276, fig. 10.101.

65 Guglielmino, this volume, fig. 3.1.

66 Cf. Podzuweit 2007, 59, pls. 30.1; 33.1–2.

67 Plákes House, Basement 10: Iakovidis 2013a, 135, pl. 50α.7. However, the Roca fragment shows a shoulder band beneath the junction of shoulder and neck, which diverges from the classic decoration of narrow-necked jugs and jugs with a cutaway neck.

68 'Causeway Deposit': Wardle 1973, 308, fig. 6.7. For the date of that deposit see the last comments by Kardamaki 2009, 335–341. See also a narrow-necked jug FT 120/121 from Selinia on Salamis, burial C (ca. LH IIIB Middle–Final), see Tzavella-Evjen 1993, 70, 83–84, fig. 14.

69 Furumark 1941, 595. For an unpainted and stratified specimen see e.g.: Mycenae, Plákes House, Basement 8, LH IIIB Final: Iakovidis 2013a, 109, pl. 36β.

one broad band right above the upper handle attachment and one band at the base of the neck.[70] The only difference lies in the triangular lip profile of that Argive specimen. Unfortunately, no other pot accompanied the amphora and remnants of a skeleton deposited inside a pit in chamber tomb XXVI. However, a very similar, but unpainted amphora was found in another chamber tomb of the same cemetery (tomb VIII) in context with a stirrup jar FT 182 indicating a date in the first half of LH IIIB.[71] Another painted specimen of FT 67 comes from the LH IIIB Final destruction level of the Tirynthian Lower Citadel, but its proportions differ from the Roca Vecchia vessel.[72]

There are no handmade types among the contemporary *Subapennine* pottery from Apulia, which could offer closer morphological parallels than the vessels from the Argolid. In addition, the vessel shape does not seem to be the result of combining characteristics taken from different Mycenaean or Minoan types. Therefore, the wide-necked amphora from Roca Vecchia may well be classified as Mycenaean in type (as opposed to Mycenaeanising). The spiraliform motif with multiple stems (in its general aspect comparable to curved-stemmed spirals FM 49) and two rows of joining semicircles FM 42 used as fringes resembles an elaborately stylised argonaut.[73] The same motif of a double row of FM 42 is hanging from the broad band at the base of the neck. Its assignation to chemical group X115 confirms its local production in Apulia.

Four of the Apulian products are clearly Aegeanising vessels that differ to variable degrees from Minoan and/or Mycenaean ceramics. The first one is a hydria, which belongs to chemical group X115. Its sherds were found scattered throughout several levels in excavation Area SAS IX (RocV 8, Fig. 2.RocV 8). Initially, they were assigned to different phases.[74] This was also due to chromatic differences between the sherds, but these later proved to be of post-depositional origin. The deepest level from which fragments of the vessel were retrieved is Level I, dating to an early phase of RBA 2. This must be the original use context of the vessel, while the vertical dispersion of the sherds finds an easy explanation if seen against the many pits that had been opened in the levels of this area during the succeeding Final Bronze Age (FBA) phases.[75]

This vessel in all its typological and stylistic details reveals the eclectic combination technique of the Apulian potters. The presence of a vertical handle from lip to shoulder and of at least one horizontal handle on the belly leaves no doubt about the classification as a hydria. However, the Roca Vecchia specimen diverges from regular Mycenaean hydriae of FT 129. The lip is flat and horizontal rather than rounded or hollowed and the vertical handle is band-shaped rather than of circular or oval cross section.[76] A fragmentary large closed vessel found at Tris Langádhes on Ithaca, in House TL, has the same flat vertical handle decorated in a very similar way with net pattern FM 57,[77] while other fragments exhibit similar lip profiles (some even with the conspicuous slight ridge directly underneath the lip[78]). In addition, one of these fragmentary closed vessels from Ithaca shows a horizontal wavy line,[79] which appears on mainland Mycenaean vessels only by LH

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70 Prósimna, chamber tomb XXVI, pit in front of the west wall: Blegen 1937, 94, 437, pl. 46, fig. 203.432: height 21.7cm; rim diameter: 11.4cm; base diameter: 7.9cm; maximum diameter: 16.9cm. Differences in decoration between the Prósimna and the Roca Vecchia vessels lie in the additional rim band of the Prósimna vessel and the two groups of three bands on belly and lower body.

71 Prósimna, chamber tomb VIII, bone heap with one skull in the northern corner: Blegen 1937, 161, 452, pl. 95, fig. 399.831, 833; Shelton 1996, 17, nos. 831 (incorrectly assigned to FT 183) and 833 (with strap handles, raised base, unpainted). For the production period of the stirrup jar type see Jung et al. 2015b, 75.

72 Tiryns, Lower Citadel, Building III, LH IIIB Final destruction: Grossmann – Schäfer 1975, 67, no. 40, pl. 46.40; Podzuweit 2007, 182, pl. 96.5.

73 Guglielmino 2008, 261–262, fig. 14.II.2; Guglielmino 2009a, 194, 199, fig. 5.4.

74 Guglielmino 2005, 639, 643, pls. 165c1; 166f1.

75 Cf. Pagliara et al. 2008, 242–243, figs. 3–4.

76 Sometimes rather flat handle cross sections occur (Mountjoy 1999, 177–178, fig. 51.390), but the band-shaped version of the Roca Vecchia specimen is singular.

77 Benton – Waterhouse 1973, 10, cat. no. 120; 11, fig. 6.120, pl. 3a120.

78 Benton – Waterhouse 1973, 10, cat. nos. 105–107; 11, fig. 6.105–107.

79 Benton – Waterhouse 1973, 10, cat. no. 105; 11, fig. 6.105.

IIIC Advanced,[80] but on Minoan jugs and amphorae already earlier.[81] House TL at Tris Langádhes is not a closed context, but it predominantly yielded LH IIIA2 pottery as well as some vessels of LH IIIB date.[82] The loop around the attachment of the vertical handle is reminiscent of the loops around Late Minoan IIIA cup handles,[83] while the loops around the attachments of the horizontal handle reappear on Late Minoan IIIA bowls.[84] The shoulder motif of the hydria from Roca Vecchia has already been identified as linked whorl-shell pattern FM 24 with the best parallels in LM IIIA2.[85] The hydria is a very rare shape in Minoan Crete. There is one unpainted example found as part of a LM IIIA1 floor deposit at Khamalévri.[86]

Taken together, the typological and stylistic elements of this hydria show an intense Minoan influence, but also traits of mainland and western Greek origin. The chronological indicators seem to point to a palace period date and even to LM/LH IIIA2, while the stratigraphical context indicates an early Post-palatial date. The fact that it belongs to the chemical group X115, the larger one of the two new Apulian groups, which consists exclusively of samples from Roca Vecchia, strongly supports local production. One fragment had already been analysed in the earlier ICP-ES programme by Jones, who also interpreted the result in terms of local production. In fact, the fragment was a member of the same cluster that included also a duplicate sample of our RocV 12 vessel (see above).[87]

In this context it is important to note that another vessel, which is a clear reproduction of a Minoan prototype, had also been included in that very ICP-ES cluster.[88] It is a small open vessel, most probably a cup with good LM IIIA2 parallels, and comes from a MBA 2–3 context.[89] This cup and the hydria RocV 8 would suggest that a local pottery manufacturing tradition for Minoan and Minoanising vessels existed at Roca Vecchia from Middle Bronze Age 3 (MBA 3) and continued into RBA 2.

A second clear Italo-Mycenaean shape is that of sample RocV 19, which is again a member of NAA group X115 (Fig. 1.RocV 19). It is a large carinated bowl with a rim diameter of 18cm, and it was found in a mixed context with pottery dating from MBA 3 to FBA 1. The interior is monochrome, while the preserved exterior decoration consists of a narrow rim band. The motif on the upper part is a broad wavy line with wide swings. The preserved portion of the lower part of the vessel is undecorated. If one compares this sherd with Mycenaean open vessels, the differences to carinated kylikes FT 267,[90] carinated cups FT 240[91] and shallow angular bowls FT 295[92] become apparent. The upper part is only slightly concave, the carination is not very articulated, the part below the carination is very straight, and the wall is of considerable thickness – in contrast to the three mentioned Mycenaean types. Carinated bowls belong to the most characteristic Italo-Mycenaean shapes in many southern Italian regions.[93] Therefore, it is not easy to decide whether the fragment RocV 19 represents a type or variety, the geographic distribution of which was restricted to Apulia.

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80 Jung 2006a, 164.

81 LM IIIB2 Khaniá: Hallager – Hallager 2003, pls. 60.84-P0629; 61.84-P1308, 70-P0951(+01-P0410); Hallager 2003, 220–221.

82 Mountjoy 1999, 469.

83 Popham 1970, 18, pl. 13c,f; Hallager – Hallager 2011, 218, cat. no. 82-P0513+, pl. 196g1.

84 Popham 1970, 32, 61, pls. 23d; 40a.

85 Guglielmino 2005, 639; Guglielmino 2009b, 490, fig. 206.

86 Andreadaki-Vlasaki – Papadopoulou 1997, 132–133, figs. 47 and 49. Usually, Late Minoan hydriae have just one horizontal handle, which is positioned on the lower part of the vessel on the same side as the vertical handle (see examples quoted by Andreadaki-Vlasaki – Papadopoulou 1997, 133).

87 Guglielmino et al. 2010, 258, tab. 1.55; 263, tab. 3 (cluster 2); 273–274, fig. 9.55.

88 Guglielmino et al. 2010, 258, tab. 1.74; 263, tab. 3 (cluster 2); 274–276, fig. 10.74.

89 Guglielmino et al. 2010, 274–276, sample no. 74.

90 Apart from the differences in profile, carinated kylikes never reach a rim diameter of 18cm, cf. Podzuweit 2007, 109, pls. 55.15–19; 56.1–4.

91 Popham et al. 2006, 139, fig. 2.1.1–5; 154, fig. 2.7.3; Andrikou 2006, 119, pl. 19.304–305; Podzuweit 2007, pls. 59.4–9; 60; 61.1–11; Stockhammer 2007, vol. II, pls. 11.196–201. 204–208; 12.211; 76.1689–1693.

92 Podzuweit 2007, pls. 42.8–18; 43.1–12; Stockhammer 2007, vol. II, pls. 43.1066; 73.1568.

93 On their differentiation from Mycenaean types and on the problem of their genesis see Jung 2006a, 110, pl. 6.1, 2.

A third undoubtedly Italo-Mycenaean shape is the globular open vessel with horizontal strap-handles on the shoulder and four grooves right beneath the lip (RocV 5, Fig. 1.RocV 5). It has been reconstructed from fragments coming from a large number of contexts that belong to the latest RBA 2 settlement phase of Roca Vecchia (Area IX, Phase V: RBA 2 final or beginning of FBA 1). Seen in a broader functional perspective, the vessel can be considered akin to a krater because of its morphological features, but with a rim diameter of 18cm it would rather fit a stemmed bowl FT 304/305. Unfortunately, its internal surface appears to be almost completely worn off. The vessel presents an interesting mixture of stylistic elements. The decoration and general syntax is undoubtedly of Aegean ancestry.

Triglyphs (panelled patterns FM 75) consisting of three lateral lines to the right and left and either vertical zigzag FM 61 or chevron FM 58 as a central element alternate with opposed isolated semicircles FM 43. These motifs are positioned in a zone between a broad rim band and at least one broad lower band. The decorative syntax is therefore close to that employed on deep bowls, stemmed bowls and kraters during the late palace period. All the motifs find good parallels among these vessel classes. One may quote deep bowls A from Mycenae[94], deep bowls B from Mycenae[95] and Tiryns,[96] stemmed bowls from Mycenae[97] and kraters FT 281/282 from Mycenae[98] and Tiryns.[99] The handle decoration, consisting of eight vertical splashes and one across each handle attachment, also follows Mycenaean prototypes. They appear on rosette deep bowls dating again to the late palace period,[100] but also on deep bowls with Close Style or linear decoration dating to the LH IIIC Advanced phase and on kraters of the same date[101] and thus roughly contemporary with the stratigraphic context of the Italo-Mycenaean vessel RocV 5.[102] However, one can find even closer parallels for the strap handles with multiple splashes. These are amphoriskoi FT 59 from LH IIIC Advanced and Late contexts,[103] which not only provide parallels for the painted decoration, but also for the peculiar handle shape (strap handles or handles with a flattened oval section) that is not attested on Mycenaean deep bowls and kraters in Greece.

In general, the shape of RocV 5 is particularly unusual. It has an in-turned upper body with a short everted rim and three parallel grooves directly below. The shape finds no precise parallel in the Aegean world but could echo ovoid jars of the southern Italian *impasto* production. In RBA 2 and throughout the FBA these often have plastic bands underneath the rim.[104] In short, the vessel

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94 House of the Idols, Corridor (LH IIIB Middle): Wardle 1969, 274–275, cat. nos. 50 and 52, fig. 6.50 (narrow triglyph with vertical zigzag and three lateral lines on both sides), pl. 62c2 (with opposed semicircles). South House, construction fill (LH IIIB Middle): Mountjoy 1976, 88–89, cat. no. 47, fig. 6.47 (narrow triglyph with chevron and three lateral lines on both sides).

95 'Causeway Deposit' (LH IIIB Final): Wardle 1973, 316–317, cat. nos. 72 and 79, fig. 11.72, 79 (narrow triglyph with three lateral lines on both sides and with central elements consisting of zigzag and chevron respectively).

96 'Epichosis' (LH IIIB Final [–LH IIIC Early 1]): Voigtländer 2003, 85, cat. no. Si 1, pls. 60.Si1; 121.Si1 (narrow triglyph with chevron and three lateral lines on both sides).

97 South House, construction fill (LH IIIB Middle): Mountjoy 1976, 90–91, cat. no. 68, fig. 8.68 (opposed semicircles).

98 Citadel House Area, Room XXXII, Phase IX (LH IIIC Early 1): Mountjoy 1999, 156–157, fig. 41.314; French 2011, 39, fig. 12.69-1531 (narrow triglyph with vertical zigzag and three lateral lines on both sides).

99 Northeastern Lower Town, Phase 1 (LH IIIC Early): Stockhammer 2007 vol. II, pl. 14.257 (narrow triglyph with vertical zigzag and three lateral lines on both sides).

100 Cf. rosette deep bowls from Mycenae: Cult Centre, Area 36, Phase VII (LH IIIB Middle): French – Taylour 2007, CD-ROM, 333–334, no. 66-528. 'Causeway Deposit' (LH IIIB Final): Wardle 1973, 329, cat. no. 162 and fig. 18.162.

101 Tiryns, Lower Citadel: Podzuweit 2007, 57–58, 67–68, pl. 23.2; 114.3. Mycenae, Granary: French 2007, 177–178, 184, fig. 6.1–2.

102 A Close Style deep bowl was found in Phase VI of Area IX, see Guglielmino 2008, 260–261, fig. 14.VI.1; 263.

103 Peratí, chamber tomb 148, in situ burial in front of W wall (Phase II, LH IIIC Advanced): Iakovidis 1969/70 vol. I, 129, 131 no. 1123; vol. II, 400; vol. III, pl. 39β.1123; Mountjoy 1999, 581–582, fig. 215.398. – Mycenae, chamber tomb 502, stone enclosure – perhaps belonging to the last interment no. III (LH IIIC Late): Wace 1932, 5, 8 no. 12; pl. 11.12; Mountjoy 1999, 175–176, fig. 50.372.

104 E.g. Giardino 1994, 209, 212, pl. 48.1; Pagliara et al. 2007, 333, fig. 11.III.25; 338, fig. 13.IV.33.

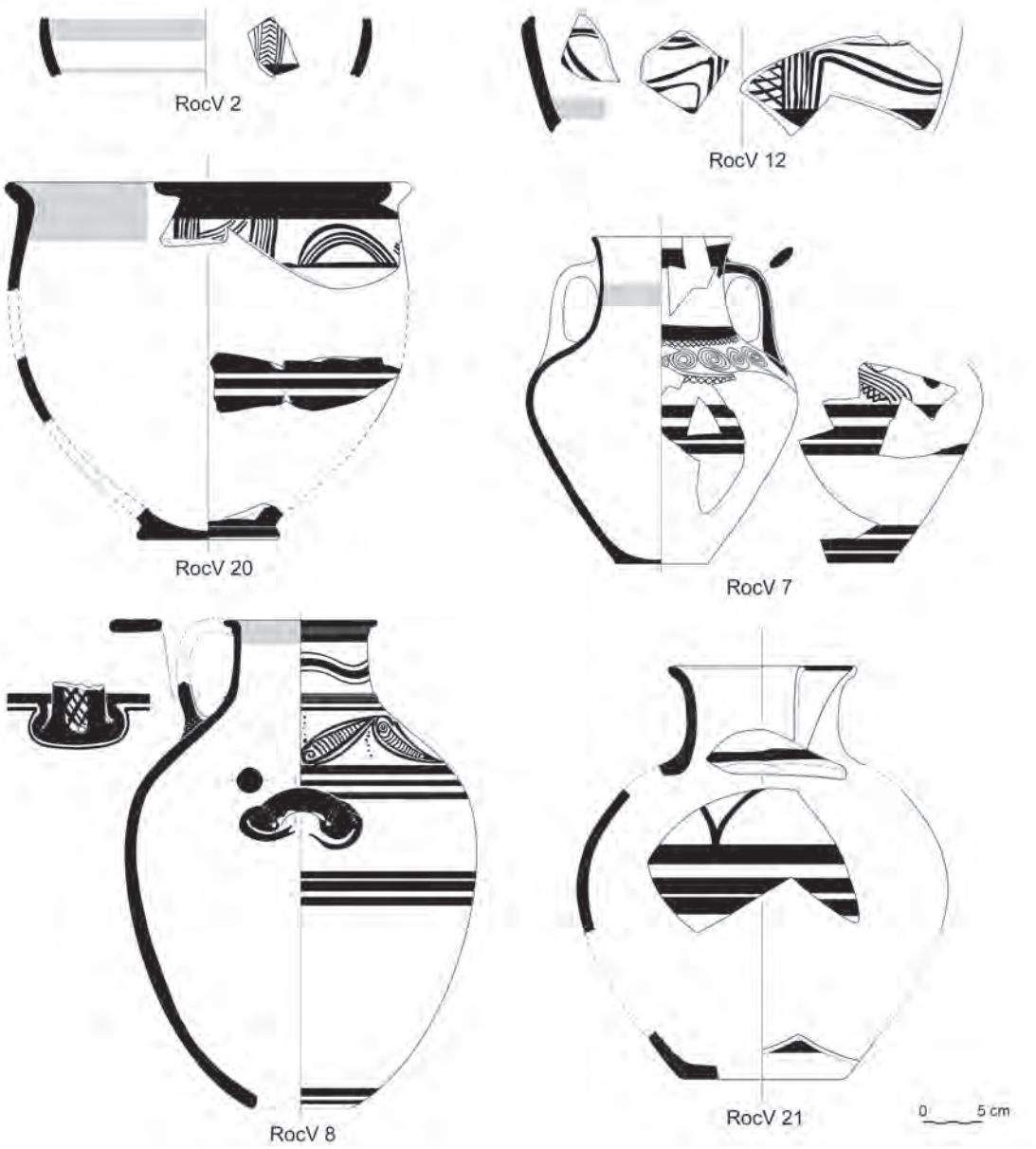

Fig. 2 Mycenaean and Mycenaeanising vessels from Roca Vecchia, analysed with NAA. Scale 1:6 (drawings: R. Guglielmino, L. Coluccia and F. Iacono)

from Roca represents a mixture of Aegean elements with local ones, while the latter were adapted to the Mycenaean style.[105]

Finally, there is a closed vessel with a profile that would suit a Mycenaean jug FT 105/106 or a hydria FT 129, but its proportions are so broad (rim diameter 16cm, base diameter 14cm, height 34cm) that it cannot be considered a regular Mycenaean type (RocV 21, Fig. 2.RocV 21). In view of the fact that 11 fragments are preserved and that these were all found in levels of an early stage of RBA 2 (Area SAS IX, Phase I), it should not be compared to vessels from the Central Hut of Broglio di Trebisacce representing a late stage of RBA 2. One may rather compare it to Italo-Mycenaean vessels from Termitito, as these show the influence of late Palatial Mycenaean workshops

[105] The plastic bands are transformed into grooves common on specific Mycenaean types during the Palatial and Post-palatial period (Mountjoy 1976, 86, fig. 5.24–26; Popham et al. 2006, 183, fig. 2.16.11; 192, fig. 2.23.4; 194, fig. 2.24.1–2).

datable to LH IIIB Middle–Developed.[106] At this site in the Basilicata we find a neck-handled amphora with a broad, flaring neck and simple (not thickened) rounded lip. Its rim diameter is larger (24cm), but its general proportions fit with the specimen from Roca Vecchia. It is decorated with different motifs of the Mycenaean palace period.[107] The Roca Vecchia vessel is overfired and moreover has a deformed rim. It might therefore be a misfired product. If this was right, one would have expected a membership in chemical group X115 or X116, but the piece is a chemical singleton. Unfortunately, the curvilinear shoulder motif is too fragmentary to be identified.

Products from Other Regions in Italy

Finally, we have analysed a single pithos sherd (RocV 18, Fig. 1.RocV 18, Fig. 3), which stratigraphically precedes the well-known fine-ware pithoi of the last FBA phase of the site (FBA 2).[108] The fragment was part of a sherd layer underneath a clay platform dating to the very end of RBA 2 or the start of FBA 1 (Area SAS IX, Phase V).[109] Being a medium coarse vessel and having a plastic cordon on the exterior, it belongs to a different class than the later, FBA 2 specimens. The shallow plastic band is decorated with an incised zig-zag line. So far, this decoration of the applied plastic band finds only a single parallel among the pithoi produced in southern Italy.[110] In the Aegean it is also rare, and, moreover, the zigzag lines on late Palatial and Post-palatial Mycenaean pithoi are not tight, but stretched.[111]

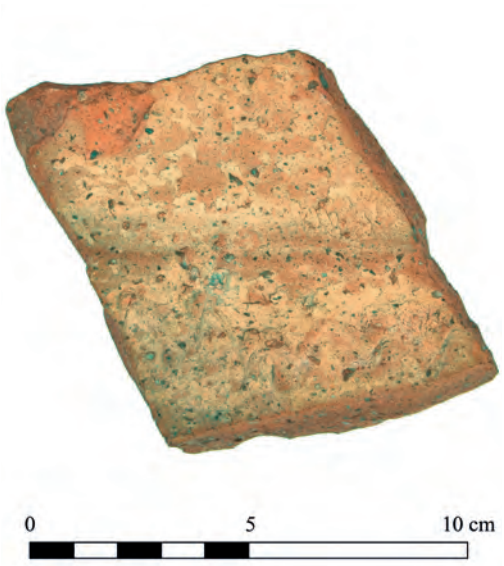

Fig. 3 Imported pithos with incised plastic band (photo: R. Jung)

The mentioned good parallel from southern Italy was found at Torre Mordillo, in a layer dating to FBA 2.[112] According to the published description, the fabric seems to differ from that of the Roca specimen.[113] Nevertheless, the plain of Sybaris is the geographical region where we should search for the workshop of the decorated pithos found at Roca Vecchia. According to the NAA, RocV 18 is a member of the group SybB with a somewhat enhanced Cs value (see Tab. 2). Three members of this group have been found at Broglio di Trebisacce, but are not local to that northern part of the Sybaris plain. Sara Levi and Maurizio Sonnino have been able to show this based on their petrographic analyses of two of those sherds.[114] The first one is a pithos sherd with a plastic band carrying a double zigzag line. Its petrographic characteristics allow an assignation to the southeastern part of the Sybaris plain (Tab. 4: sample Brog 15).[115] The

[106] Protome Painter A and Pieridis Painter A, see Güntner 2000, 228, 236, 350, 367–369; Vagnetti 2001b, 108–110, figs. 2–5; Jung 2005, 59–60.
[107] De Siena 1986, 52, fig. 11; Bettelli – Levi 2014, 321, pl. 4.62.T43. The size of this fragmentary vessel from Termitito exclude a classification as FT 67.
[108] Guglielmino 1999.
[109] For the context see: Pagliara et al. 2008, 247.
[110] Schiappelli 2015, 238, fig. 6a.
[111] Tiryns, Lower Citadel, LH IIIB floor of 'Building 4': Grossmann – Schäfer 1975, 63, no. 3, pl. 44.3. – Tiryns, Northeastern Lower Town, Phase 2 (LH IIIC Early 2): Stockhammer 2007, vol. II, 89, pl. 63.1371. – Lefkandí, Phase 2b (LH IIIC Advanced – Late): Popham et al. 2006, 211, pl. 42.9.
[112] Arancio et al. 2001a, 135–136, fig. 73,20; Arancio et al. 2001b, 203–204.
[113] Arancio et al. 2001b, 203–204: wheelmade, with very few inclusions.
[114] Jung et al. 2015a, 459.
[115] Levi – Sonnino 1999, 67, fig. 27 (zone F); 69; 105; 123, fig. 79.BT932.

Bonn sample number	Sample number in Jones – Levi 2014, 182, tab. 4.7d; Jones 2014, 544, tab. 10; 546, tab. 11	Sample number in Levi 1999	Type	Publication of the sherd/vessel	NAA group	Comments	Petrographic group
Brog 1	BTA001, A13, BT706		belly-handled amphoroid krater of Italo-Mycenaean type, pattern-decorated	Bettelli – Levi 2014, 285, 326, fig. 4.67.A13; Bettelli, this volume, fig. 3.2	SybA		
Brog 2	BTA003, A48, A49, BT704		large closed Mycenaean vessel, monochrome	Bettelli – Levi 2014, 285, 322 fig. 4.63.A48	generally Greek (AkaR, TheB, …)		
Brog 3	BTA004, A9, A65, BT705		belly-handled amphoroid krater of Italo-Mycenaean type, pattern-decorated	Bettelli – Levi 2014, 285, 325, fig. 4.66.A9; Jung 2006a, 105, fig. 11, pl. 6.3; Bettelli, this volume, fig. 3.3	SybA	Jones – Levi 2014, 188: 'local … overfired'	
Brog 4	BTA005, A8, A33		belly-handled amphoroid krater of Italo-Mycenaean type, pattern-decorated	Bettelli – Levi 2014, 285, 323, fig. 4.65,A8; Jung 2006a, 106, fig. 11, pl. 7.2; Bettelli, this volume, fig. 3.1	SybA		
Brog 5	BTA068, A63		vessel of Mycenaean or Italo-Mycenaean type	unpublished	Early MYBE		
Brog 6	BTA069, A 69		vessel of Mycenaean or Italo-Mycenaean type	unpublished	SybA		
Brog 7	BTG025		wheelmade Grey Ware vessel	unpublished	SybA		
Brog 8	BTD034		pithos	unpublished	SybB (= old BroC)		
Brog 9	BTF043		matt painted fine-ware vessel	unpublished	Singleton		
Brog 10	BTI070, I 11		impasto vessel	unpublished	BroD	Middle Bronze Age	
Brog 11	60A	BT 60	large impasto cup	Levi 1999, 122, fig. 78.BT60 ['BT960' is a printing error]; elenco 4g(2)	BroD		southern plain of Sybaris

Bonn sample number	Sample number in Jones – Levi 2014, 182, tab. 4.7d; Jones 2014, 544, tab. 10; 546, tab. 11	Sample number in Levi 1999	Type	Publication of the sherd/vessel	NAA group	Comments	Petrographic group
Brog 12	BT 219A	BT 219	carinated impasto bowl	Levi 1999, 167, fig. 142. BT219; elenco 2b(1)	singleton (but generally Sicily)		KX2
Brog 13	BT 904A	BT 404	if 'BT 404' is correct: impasto jar	if 'BT 404' is correct: Levi 1999, 121, fig. 77.BT404	HimA / SybB	according to Levi 'BT 404' is possibly correct	if 'BT 404' is correct: southern plain of Sybaris
Brog 14	BT 919A	BT 919	pithos base	Levi 1999, 171, fig. 146. BT919; elenco 2c	HimA / SybB		A2
Brog 15	BT 932A	BT 932	pithos with incised plastic cordon	Levi 1999, 105, 123, fig. 79.BT932; elenco 2c	SybB (= old BroC)	coarse-ware pithos	southeastern plain of Sybaris
Brog 16	BT 941A	BT 941	pithos with channelled decoration	Tenaglia 1994, 355, pl. 65.2; Levi 1999, 172, fig. 147. BT941; elenco 2c	SybA		AF3-2
Brog 17	BT 962A	BT 962	pithos with channelled decoration	Levi 1999, 105, 124, fig. 80.BT962; elenco 2c	SybB (= old BroC)	coarse-ware pithos	southern-central and southern plain of Sybaris
Brog 18	BT 978A	BT 978	pithos	Levi 1999, elenco 2c (not illustrated)	HimA / SybB		A4
Brog 19	BT 989A	/	pithos	unpublished	Singleton		

Tab. 4 Group assignations of 19 samples from sherds and vessels found at Broglio di Trebisacce (northern plain of Sybaris) analysed in Bonn. For raw data see Jones 2014, 544, tab. 10; 546, tab. 11; for group SybB (= old BroC) see Mommsen 2014, 19, 25, tab. 6; for group SybA see Mommsen 2018–2019, 111–112, tab. 1; for group HimA see Edel forthcoming

second one is a pithos fragment with grooved decoration (close in type to the FBA 2 pithoi from Roca Vecchia, Tab. 4: sample Brog 17). This sherd has petrographic characteristics that point to the southern-central and southern plain of Sybaris (including the region of Torre Mordillo).[116]

Unfortunately, the pithos sherd with incised zigzag found at Torre Mordillo has not been analysed – neither with chemical nor with petrographic methods. According to the published description it is less coarse than the vessel RocV 18. However, this does not necessarily preclude that both pithoi were produced with clay from the same clay deposits, for the Mycenaean-type members of group SybB from Punta di Zambrone likewise have far fewer and much finer inclusions than the pithos sherd from Roca Vecchia.[117] Furthermore, the results of petrographic research in the Sybaris plain indicate that, in general, pithoi with plastic bands carrying incised decoration were a typical product of the southern regions in the plain.[118] They reached the northern regions, sites such as Broglio di Trebisacce, as imports from the Recent Bronze Age onwards. Almost 50% of the pithoi from the late RBA 2 layers of the so-called Central Hut at Broglio consist of imports from the southern plain.[119]

In view of these comparative data it is possible that the pithos from the southern plain of Sybaris reached Roca Vecchia during a late stage of RBA 2, when, for the first time, larger quantities of such pithoi were not only produced, but also exported to other areas of southern Italy.[120]

Conclusions

The NAA results of the Roca Vecchia Aegean and Aegeanising pottery offer new and valuable insights into the considerable variability of ceramic production and exchange processes during the Recent Bronze Age. First of all, it is important to note that a smaller number of imports from the Aegean is opposed to a larger quantity of most probably local products, which exhibit two different clay recipes. In the earlier analytical programme using ICP-ES only one local group of Aegean pottery was formed by principal component analysis.[121]

A second important point to make is the high quality of several most probably local products that are members of NAA group X115 – be they Mycenaeanising, such as RocV 5 (Fig. 1.RocV 5), or of Mycenaean type, such as RocV 20 (Fig. 2.RocV 20). Both of these vessels are fired very hard and were produced with rather well levigated clay with only a few fine to medium white inclusions and carry lustrous red paint (cf. above for more details of macroscopic observations: Ferich group). The neck-handled amphora RocV 7 (Fig. 2.RocV 7) has only very few white inclusions of coarse size and is fired 'clinky' hard, while the paint is dull to slightly lustrous. Third, not only the technology transfer was successful, but the linear and monochrome decoration as well as the adoption of motifs also attest to close contact with Aegean workshops. Even on the Aegeanising shapes, motifs of Mycenaean and Minoan origin were used and integrated into a decorative

116 Levi – Sonnino 1999, 67, fig. 27 (zones D and E); 69; 105; 124, fig. 80.BT962.

117 PZ129/P30 (sample Zamb 20): very few fine, white particles (large closed vessel, no fabric assignation). – PZ1B-BCC8/1, PZ95FFGG10/1, PZ1/44.45 Area C (Zamb 18): very few fine to medium inclusions, white particles and perhaps mica (small open vessel, fabric PZ-M4). – PZ1FFGG10/3 (Zamb 31): much fine mica, very few white particles of medium size (krater, fabric PZ-MU4). – PZ176/P16 (Zamb 42): few fine mica particles (small open vessel, fabric PZ-M18).

118 Levi – Sonnino 1999, 105–106.

119 Levi 1999, 106–107, fig. 65. Most of the fragments with incised cordons come from FBA levels or were stray finds, but the undecorated cordons are characteristic of the RBA levels at Broglio (Tabò 1998, 160–162, 172, pl. 6.1–3; Levi 1999, 123, fig. 79.BT932, BT966, BT958, BT982).

120 So far, the pithos RocV 18 is one of two of its type found at Roca Vecchia, which might suggest that exported pithoi from the southern plain of Sybaris first and foremost reached sites located at a smaller distance from their production region.

121 Guglielmino et al. 2010, 262–265.

syntax of Aegean derivation suited to the relative vessel shape (judged from an Aegean point of view). Fourth, the Mycenaean-type vessels outnumber the Aegeanising vessels among the local products. Furthermore, the predominance of deep bowls FT 284/285 and kraters FT 281/282 accompanied by large closed vessels and stirrup jars is reminiscent of contemporary Mycenaean settlement assemblages.[122] One gets the impression that the Apulian workshops producing for consumers at Roca Vecchia wanted to create a repertory of Aegean style – even in those cases, where they decided to create new shapes and shape variants. They drew heavily on late Palatial prototypes that are attested until LH IIIB Final and also used those palace period motifs in the second RBA settlement phase.[123] Fewer local products (e.g. RocV 11[124] and 12, Fig. 2.RocV 12) and most of the Mycenaean imports exhibit traits of early Post-palatial style.

According to a common explanatory model, the local production of Mycenaean pottery and Aegeanising pottery in southern Italy is due to either immigrant[125] or itinerant[126] Aegean potters. This model has been criticised on various occasions with reference to the results of previous archaeometric studies.[127]

One of the problems resulting from this approach would be the apparent isolation of the foreign potters, who, once settled in a place, would have worked quasi in isolation, i.e. without exchange and dialogue with workshops in other southern Italian settlements, which is especially astonishing during a time of increased trans-Mediterranean mobility such as the later 13th and earlier 12th centuries BCE. Moreover, since the local production of wheelmade and painted pottery started by the Italian MBA, one would have to imagine that only imported Mycenaean pottery circulated among the Italian settlements, not the local products, which are sometimes even difficult to differentiate from imports without chemical analyses (especially in cases such as Roca, where the products of group X115 are of very good quality). At the same time, throughout the last centuries of the 2nd millennium BCE Italian relations to the Aegean would have been continuous, as the evolution of the Italo-Mycenaean styles demonstrates that new typological and stylistic features were regularly taken up by the local workshops.[128] This critical reasoning is reinforced by the analytical results we present here, for none of the 44 analysed Aegean-type vessels from Punta di Zambrone belongs to any chemical group representing workshops in Apulia. Thus, the hypothesis according to which Italo-Mycenaean pottery was transported in limited quantities together with the main import products from Greece seems to be excluded for the case of Punta di Zambrone.

We briefly note that these seemingly contradictory elements of historical reconstruction can also not be explained by a recent model according to which two different kinds of exchange and contact networks existed in southern Italy. The first would have been an indigenous one that is said to be archaeologically visible by means of bronze objects of Subapennine type. The second one would have been a maritime one that can be traced via Aegean pottery (both imported and local). While the first network should have been run by the populations of southern Italy, the second one should have been in the hands of Aegean merchants, who were temporary residents in the Italian coastal sites.[129] Even if we disregard for a moment the severe methodological flaws

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122 For shape frequencies in phases I and II of Area SAS IX see Iacono 2015, 266–268 with fig. 3 and tab. 2. Cf. the statistics of settlement pottery from the Argolid: Podzuweit 2007, 189–205, Beil. 44a–b, 47, 65–68; Kardamaki 2009, 455, tab. 5; 460, tab. 22; 461–462, tab. 27.

123 This is also true for the stemmed bowl FT 304/305, a Peloponnesian import according to the first analysis programme (Guglielmino et al. 2010, 258, tab. 1.49; 263, tab. 3 [cluster 2]; 273–274, fig. 9.49), for there are three almost exact parallels among the *Epichosis* material of Tiryns (LH IIIB Final [–LH IIIC Early 1]). They show the same combination of tricurved arch FM 62 with FM 43 and in one case also with triglyph FM 75, see Voigtländer 2003, 69–70, cat. nos. HS77–79, pls. 44.HS77, HS78; 45.HS79.

124 Guglielmino, this volume, fig. 2.6.

125 Immigrating on the basis of political contacts between the Mycenaean state and clientele chiefs in Italy: Peroni 1996, 25–34, 281–288.

126 In the economic context of a hypothetical free market: Bettelli 2011, 112–117.

127 Jung 2005, 59–60; Guglielmino 2013, 146–147; Jung 2017, 54–55.

128 Guglielmino 2013, 146–147.

129 Blake 2014, 219–227.

in the use of the archaeological evidence,[130] this proposal is unable to explain many problems. One is the question of why such hypothetical Aegean 'merchants' seem to have delivered proportionally fewer imports to the coastal settlement of Roca Vecchia, situated at the point of the shortest distance to the eastern Adriatic coast, while proportionally more Aegean pots reached Punta di Zambrone on the southwestern coast of Calabria during the beginning of RBA 2. There is obviously an issue of sample size that does not escape our attention, in that the sample from Roca is considerably larger than that of Punta Zambrone and more analyses are needed for the Apulian site. Yet at present the situation seems to confirm this general trend. One might argue that at that time the Aegean 'merchants' found some desirable goods in the Tyrrhenian and therefore concentrated on the western regions. However, even the distribution of imported and locally produced Aegean and Aegeanising pottery in the southeast of Italy is very uneven. Thus, what we see cannot have been a single network 'not only supplied, but run by an outside group'[131] of Aegean 'merchants', who would have brought similar products to all consumers along the Italian coasts. In such a case we should expect evidence comparable to that in the eastern Mediterranean and Cyprus with Aegean exports from some recurrent production regions with similar type repertoires oscillating inside some quantitative margins set by the economic and political importance of each importing community.[132] By contrast, in Italy, we see a remarkable variability from site to site, if we just focus on the middle and late phases of LH IIIB and compare typological and archaeometric evidence. Scoglio del Tonno predominantly received Mycenaean imports. Potters at Termitito produced predominantly Italo-Mycenaean shapes while using Mycenaean palatial motifs (pictorial and non-pictorial).[133] At Roca Vecchia imports arrived, while local potters reproduced many Mycenaean vessel types with Mycenaean decorations and motifs and created a few new Italo-Mycenaean types.

A model better suited to this variability of the late 13th and the 12th centuries BCE would be one that seeks the initiative for the establishment of exchange relations more on the side of the Italian communities than on the side of the Mycenaean and Minoan communities.[134] Such an approach accords with the small scale settlement systems of the time[135] and could also better explain the new NAA results for Punta di Zambrone and Roca Vecchia. Most probably, the population of each coastal settlement developed its own mechanisms for acquiring Aegean products – be it through different types of exchange; through emigrated craftsmen, who became trained specialists in Greece and subsequently returned; or through war and piracy.[136] The distribution of ceramics from the southern Sybaris plain (members of group SybB) easily fits such a model. Apparently, at the onset of RBA 2 peasants and craftsmen in this region were able to generate a product surplus large enough to enter into targeted exchange relations with other settlements both in the Tyrrhenian and in the Adriatic. The production of agricultural surplus unfolded, augmented throughout the RBA

130 Blake stresses the impression that Aegean pottery and Italian bronzes do not appear at the same sites and to a certain degree seem to exclude each other (Blake 2014, 226–227 with fig. 8.4). She misses the decisive factors responsible for the described artefact distribution, i.e. that bronzes have only rarely been found in southern Italian settlements, and bronze hoards as well as tombs equipped with bronze objects are a rarity in southern Italy. This means she did not take into account the filters shaping the archaeological record and created by burial customs, deposition rituals and recovery of bronzes from abandoned settlements. Archaeologically visible distribution of object types does not directly translate into the regions, in which those types were used. Apart from that, she did not even mention the large hoard from the acropolis of Lipari (Bernabò Brea – Cavalier 1980, 733–789) nor the bronze objects from the RBA levels of Roca Vecchia (published in Pagliara et al. 2007 and Pagliara et al. 2008). Both are cases of settlements, in which much Aegean-type pottery and a variety of Subapennine bronzes have been found and which therefore contradict her thesis.

131 Blake 2014, 227.

132 For a discussion of Aegean pottery exported to the eastern Mediterranean see: Jung 2015.

133 For a more detailed discussion of the Termitito and Scoglio del Tonno evidence see: Jung 2005, 58–60 and Jung 2017, 54–56.

134 Jung et al. 2015b, 92–93; Iacono 2016, 135.

135 Cf. Jung et al. 2015a, 460.

136 Jung 2017.

and reached a peak at the end of RBA 2, when products from the southern plain of Sybaris were exported by means of pithoi on an unprecedented scale – as shown by the Broglio evidence, but now also by the rather long distance transport of such pithoi to Roca Vecchia in Adriatic Apulia.

Finally, the decentralised model mainly based on an Italian initiative can also account for the good attestation of products from western Greek regions and the absence (or possibly scarce attestation among non-analysed pieces) of Argive imports at both Punta di Zambrone and Roca Vecchia for two main reasons. First, the western Greek regions (Ionian Islands, Acarnania, Achaea and Elis) were simply the closest ones to reach for ships coming from the Adriatic or from the Tyrrhenian Sea via the Adriatic. Probably vessels produced in western Greece – especially in the northwestern Peloponnese (in Achaea and Elis) – are also hidden in the group of imports identified by Jones in the first programme of provenance analyses applied to Roca Vecchia ceramics.[137] Southern Italian communities were mostly interested in painted products, but occasionally also received unpainted fine-ware pots – again of western Greek origin –, both at Roca Vecchia and at Punta di Zambrone. Second, it appears that the Palatial pottery workshops in the Argolid did not produce any specific ceramics for those Italian consumers,[138] who apparently were not able or interested in producing for exchange purposes sufficient surplus to have been of particular interest to the Aegean palatial economy.[139] This is borne out by the NAA evidence from Roca Vecchia and Punta di Zambrone and further confirmed by the fact that at Termitito the Argive pictorial motifs are only found on locally produced Italo-Mycenaean pots, not on imports.

We have to note, in addition, that a smaller portion of the imports at Punta di Zambrone could be assigned to western Crete, for which a longer sea route had to be taken.[140] Likewise, it has been proposed that certain imports found at Roca Vecchia[141] originated in western Crete. Especially some coarse ware stirrup jars have been assigned a provenance from this island. However, the archaeometric data base presented for such a conclusion seems to be rather weak for a positive assignation.[142] The typology of those stirrup jar fragments is comparable with Cretan coarse-ware stirrup jars, and there is the mentioned Minoan influence present in the local Aegean pottery production at Roca Vecchia (see above).

To sum up, the picture that can be reconstructed based on the new analytical evidence from Punta di Zambrone and Roca Vecchia is one of small-scale communities with variable economic capacities and independent, targeted exchange relationships established with other communities along the coasts of southern Italy as well as with specific sites in the Aegean that were predominantly situated in its western regions.

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137 See especially some samples assigned to the northern Peloponnese, because they show a lower Ca content than the Mycenae/Berbati group (Guglielmino et al. 2010, 263–264, fig. 4). A. Hein, A. Tsolakidou and H. Mommsen observed that samples of the Mycenae/Berbati group have a higher Ca content than the group ACH-a assigned to the regions Achaea and Elis (Hein et al. 2002). This group has now increased to over 400 samples and was renamed OlyA (Jung et al. 2015a; Mommsen et al. 2016), since several clay samples with Ca content of about 10–12% from the region of Olympia match this pattern (s. sample Kata in Hein et al. 2002). Both low and high (2–12%) Ca weight concentrations occur in the samples of this group, presumably reflecting recipe variations of clay preparation. This is the reason that Ca is now not taken in Bonn during statistical grouping calculations. The pattern OlyA and MYBE can be distinguished mainly by the lower Cs and Rb values in Achaea/Elis.

138 In contrast to what they did until LH IIIB Middle on a large scale for partners in the eastern Mediterranean.

139 Iacono 2015, 260; Jung et al. 2015a, 460.

140 Jung et al. 2015a, 459.

141 In the same Recent Bronze Age deposits at Roca from which the samples analysed in this paper derive.

142 Guglielmino et al. 2010, 259–261, tab. 2. 364, 430 (531 no data given); 264; 277–278, fig. 11.364, 439, 531. The composition of only the lanthanides is compared to the composition of a group from Chaniá from the Berkeley/Bonn laboratories without an interlaboratory data calibration.

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