AFTER THE FACTORIES. NEW RESEARCH, DEVELOPMENT AND ENHANCEMENT PERSPECTIVES FOR THE SUBMERGED PORT DISTRICT OF THE RIPA PUTEOLANA (POZZUOLI, NAPLES)

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ABSTRACT

On a coastline of almost 2 km, between the center of the port of *Puteoli* and the *Portus Julius*, the submerged districts of the *ripa Puteolana* constitute an underwater archaeological area of extraordinary importance, gravitating around the *vicus Lartidianus* and the *vicus Annianus*. the headquarters of merchants and pilgrims from every corner of the Mediterranean, the endless rows of *horrea* at the service of the fleets of Rome. For a long time this exceptional context was only scarcely explored, due to the heavy and impactful presence of the industries that for most of the twentieth century characterized the west coast of modern Pozzuoli. With the post-industrial phase following the closure of almost all production plants, the great challenges of the regeneration and reconversion of this complex waterfront, with the abandoned factories just above the ancient walls, have begun. With the project *Between land and sea. Studies and research in the coastal areas of the Campi Flegrei,* born in 2021 from an agreement between the SABAP for the metropolitan area of Naples and the University of Campania Luigi Vanvitelli, with the collaboration, for the submerged areas, of the Scuola Superiore Meridionale, a systematic documentation program of the *ripa Puteolana* has finally been launched: only a modern scientific knowledge could offer to the politicians and to the decision-makers the tools for a regeneration of the coast that concretely takes into account the very high density and uniqueness of submerged archaeological remains of the ancient port; only the scientific knowledge, at the same time, will made the involvement of local communities in the protection of the common heritage a real possibility.

Keywords: *Puteoli*, ports and harbous, waterfront, urban regeneration, submerged structures, coastal archaeology.

Between the land and sea. A project for the coastal areas of the Phlaegrean Fields

The Phlaegrean coast, characterized by a considerable density of archaeological evidence, both on land and at sea, represents an area of extraordinary interest, in which the testimonies of the human presence are inextricably linked to the environment and its geomorphology.

The coastal area has always been deeply conditioned by the long sequence of geological events and the phenomena of emergence and submersion of the soil. Volcanism and bradyseism, in fact, if on the one hand have played an important role in settlement dynamics over time, on the other hand have preserved a very rich archaeological documentation below the present sea level. The coastal strip between the port of Pozzuoli and the Lucrino Lake, in fact, up to about 400 m from the current shore, is densely scattered with evidence of the Roman age [1].

Precisely the attention for the transformations of the soil and for the geological phenomena, also of great importance for the morphology of the territory and of great impact on the typologies of settlement, gave a notable impulse, between the end of the XIX century and the beginning of the XX century, to the interest in the submerged archaeological evidence of the Phlegrean coast, considered as a marker of the geological transformations of the area. This interest was increased, in the same time, by the first occasional discoveries at sea of archaeological artefacts, such as capitals and inscriptions [2].

After the Second World War, around the end of the 1950s, the development of new methodological approaches, thanks to the increasingly widespread use of aerial photos [3], contributed to the emergence of systematic research projects in Phlegraean waters: the first underwater campaigns by Lamboglia and Maiuri at Punta Epitaffio had no continuity and involved only a limited area, but for the first time faced the problem of graphic and photographic documentation of submerged structures, inaugurating a new season of research based on systematic studies [4].

As far as the *Ripa puteolana* is concerned, frequent underwater recoveries, many of which were completely arbitrary, and the progress of knowledge based on methodologically solid foundations, made possible the recognition of a large part of the suburb of the city of Puteoli [5].

In particular, the stretch of sea between the long pier in front of the former Pirelli factory, now Prysmian, and the SOFER dockyard, yielded numerous evidence and finds which then allowed the identification of the two *vici Lartidianus* and *Annianus*[6].

Only scarcely explored, due to the heavy and impactful presence of the industries that for most of the twentieth century characterized the west coast of modern Pozzuoli, the *Ripa puteolana* areas constitutes a context of exceptional importance and with an enormous potential, with a practically uninterrupted series of buildings, in a good state of conservation, around the nuclei of *vicus Lartidianus* and *vicus Annianus*[7].

With the project *Between land and sea. Studies and research in the coastal areas of the Campi Flegrei,* born in 2021 thanks to an agreement between the Superintendency of Archaeology, Fine Arts and Landscape for the metropolitan area of Naples and the University of Campania Luigi Vanvitelli, with the coordination, for the submerged areas, of the Scuola Superiore Meridionale, a systematic documentation program of the *ripa Puteolana* has finally been launched, together with a research and enhancement program of the entire coastal areas of *Misenum* and *Puteoli,* of the Averno and Lucrino lakes and on the hinterland until *Monte Gauro*.

An initial mapping with the aid of aerial and underwater drones of the entire submerged area has been followed, and is still ongoing, by a patient and meticulous work of documentation in the water of all the structures, cataloged with the support of a cloud-based GIS and organized on the basis of construction techniques and functional purposes, with a clear distinction between the different chronological phases.

The submerged archaeological sites, from a certain point of view, are more protected than the sites on the land, because they are less subject to the activities connected, for example, to the building development which, in the Phlegraean area, has never known setbacks: the entire coastal area of Pozzuoli, in fact, has undergone, over time, the impact of industrialization; with the change of the entire structure of the sea front, the construction of new port structures, industries and buildings functional to them has strongly modified and altered the ancient landscape[8], already partially compromised by the volcanic events.

All these elements sometimes make it difficult to read and interpret the evidence and the Pozzuoli archaeological landscape, transformed on several occasions and, for these reasons, within the context of the protection operations of the Superintendency of Archaeology, Fine Arts and Landscape for the metropolitan area of Naples, particular attention was paid to preventive archeology activities, preliminary to public works both on land and at sea. An important protection tool for the *Ripa* was activated already in the 1980s with the archaeological constraint of the submerged structures which from Baia to the foot of the Rione Terra.

In this sense, the preventive archeology investigations, still in progress, connected to the public works, are offering further useful pieces for the recomposition of this portion of the coast; some research has focused especially on the land areas overlooking the *Ripa puteolana*, near the *vicus Lartidianus*, where a stretch of paved road which from the coast went up the *Vallone Cordiglia*[9] and hooked up to the *via Domitiana*, in the upper part of the suburb (where other *horrea* were located[10]), was already known.

In the current area occupied by *Sud Cantieri* (*Cantieri Maglietta*), on the other side, in an area formerly delimited to the East by the sector of the *ripa* called *Hortensiana* and by the modern port, the excavations of the 1990s made it possible to identify a building complex, probably with a thermal function and with phases ranging from the Augustan age to the IV century AD[11]. In addition to the sandy deposits rich in ceramic materials and marble fragments that identify the seabed of the early Imperial and the Flavian Ages, some partially submerged wall structures, with an extension towards the land, aligned with the axis that crosses the *Vallone Cordiglia*, have been located at about -3.50 m below the current sea level. In the absence of an excavation, at the moment, it is difficult to define the exact function of these structures, probably connected in part with the road network and in part with port activities.

It therefore appears evident how *Puteoli* and its *ripa* present problems related to the knowledge, protection and conservation of the archaeological heritage that are completely different but at the same time closely linked: on the one hand, in fact, we note the impact of the modern urbanization of the coastal stretch; on the other hand, the relationship between what is documented on land and what still needs to be documented at sea represents a decisive key to understanding. The knowledge of the topography of *Puteoli* cannot ignore the submerged area which is in fact an integral part of the context[12]. Today, in fact, the link between these two realities is altered and it is difficult to perceive the continuity which, however, must have characterized the ancient landscape in this stretch of coast.

The most significant contribution of the Superintendency of Archaeology, Fine Arts and Landscape for the

metropolitan area of Naples, in the context of this new project on the *Ripa*, addresses precisely the problem of recomposing the relationship between these two parts of *Puteoli*, the submerged one and the one that today lies on the current coastline, integrating the data into a more balanced and organic overall reading. The development of knowledge is an indispensable tool, in a phase of great infrastructural impulse, to guide new projects and make them compatible with archaeological remains.

The entire *Ripa puteolana* represents, in fact, a part of a much more complex system which extends along the whole Gulf of Pozzuoli and which emerges, especially for the Augustan age, as one of the most relevant examples of the organization of a great urban space, and the development of architectural solutions typical of a large commercial and port area, which reflects the prestige of a cosmopolitan city, overlooking the Mediterranean.

(M.L.T.)

The Ripa Puteolana

The importance and the extent of the commercial Roman port of Puteoli is well known and widely described by the ancient sources; probably the harbour had a progressive development, through successive phases of growth starting from a first nucleus at the base of the ancient Greek acropolis of the *Rione Terra* [13], and reached colossal dimensions already in the Augustan age, extending from the sector now occupied by the modern commercial port of Pozzuoli [14], up to the basins of the Lucrino and Averno lakes, and to the *Portus Julius* system [15], built in a very short time by Agrippa in 37 BC to offer a quick and immediate response to the piratical threat by *Sextus Pompeius*.

Actually, the literary and the epigraphic sources provide us with the picture of a gigantic and multi-articulated port, only partially affected by the inauguration of the ports at the mouth of the Tiber by Claudius and Trajan [16], and still fully functioning, with new renovations and restoration works, in the Theodosian age [17]; on the other hand, underwater archeology offers to the researchers the picture of an exceptional context today submerged due to the effect of bradyseism, extending along a coastal strip of over 4 km, up to the *Punta dell'Epitaffio* and to the natural junction with the residential and palatial area built around the *lacus Baianus*.

The *ripa Puteolana*, the stretch of coast physically connecting the republican nucleus of *Puteoli* with the new *portus Julius*, offering a continuous waterfront of almost 2000 linear meters and a commercial and residential space for the lively communities of *mercatores* and *peregrini* who progressively established new settlements and commercial *enclaves* around the basin, in the *vici Annianus* and *Lartidianus* [18], has long remained hidden from view and knowledge, in particular due to the cumbersome presence of the industrial district which arose starting from the end of the 19th century in the suburb of modern Pozzuoli: shipyards (the *Cantieri Armstrong*, providing ships to the Italian fleets), heavy metallurgical industries, and in the recent years SOFER, producing trains, and Prysmian, the last plant still in operation, engaged in the production of massive skeins of cables for transoceanic communications. The heavy water pollution and the presence of the factories on the coast, physically separating the sea from the city, have effectively made the entire sector of the ancient *ripa* completely inaccessible; considering this situation, it's not surprising if the first underwater exploration of the area was performed only at the end of the 1980s, when a group of researchers coordinated by Giuseppe Camodeca created the first archaeological map of the submerged structures (fig. 1), on the basis of aerial imagery coordinated with punctual investigations in the sea; the operations, notwithstanding the low visibility of the water [19], revealed for the first time, in the heart of the *vicus Lartidianus*, the existence of the extraordinary sanctuary of the Nabataeans, the unique out of their mainland, from which came the altars and inscriptions merged into the collections of the Museums of Naples and of the Campi Flegrei [20]. Despite the extent of those discoveries, the research effectively stalled after a few years, and very little was added to what was published at the end of those early campaigns [21].

However, the image of a long, densely built-up coastal strip, characterized by the presence of an endless sequence of buildings with an elongated rectangular plan, often arranged along communication axes and sorting courtyards, and certainly to be interpreted as *horrea*, as well as by the presence of massive concrete quays, clearly visible from the aerial photos, which in fact marked the entire land-sea interface from one point of the Gulf to another, was finally offered to the scientific community. The plan also made it possible to position and identify for the first time even monuments already known from travel reports and nineteenth-century works, starting with the so-called portico of the Nymphs, for a long time confused with part of Cicero's villa in *Puteoli*, distinguished by an alignment of columns arranged next to a building in whose filling levels materials, interpreted as the evidence of the existence of a sculptor's workshop [22], had been recovered. The long waterfront therefore seemed close to a

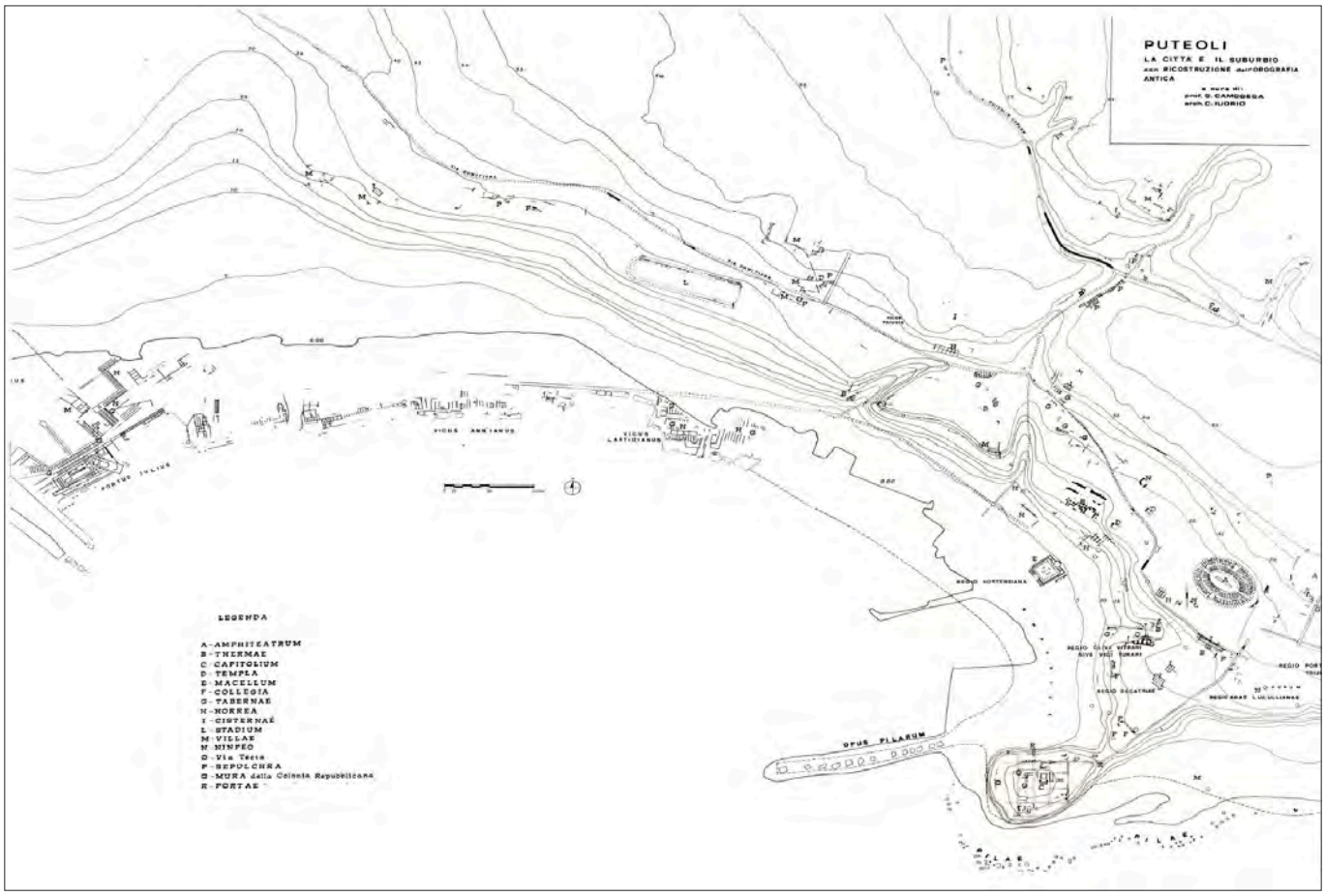

Fig. 1 - ***The submerged area of Puteoli (da Camodeca 1994).***

definitive publication of what had been incredibly preserved on the seabed, but despite the efforts of the protagonists of those campaigns, the light and interest went out again in the area, just while the nearby area of *Baiae* finally became an international model of reference for the archeology of submerged sites, and while large international projects, above all the powerful effort of the PortusLimen Project, coordinated by Simon Keay and Pascal Arnaud, drew the attention of the scientific community to the large ports of the ancient Mediterranean and to the complex networks of trades and relationships that interrelated them.

(M.St.)

Towards a new mapping of the Ripa Puteolana: drone surveys and WebGIS

An updated and systematic study of the *Ripa Puteolana* would not be complete without a new cartographic description of all the submerged and semi-submerged features that are only partially visible in the satellite images available today.

As mentioned in the previous paragraphs, the knowledge of the structures between *Puteoli* and Lucrino, traced back to the *vici Lartidianus* and *Annianus* is known mainly thanks to the studies of Giuseppe Camodeca, the results of which are summarised in the plan first published in 1987 and then updated in 1994 and 1999 [23]. Thanks to this reconstruction plan on a scale of 1:2000, drawn up by Camodeca himself in collaboration with the architect Iuorio based on a careful study of aerial photographs taken at the zenith, and progressively completed and verified by underwater surveys [24], it has been possible to visualise the integrated system of port structures of a commercial nature that, at least from the Augustan age, extended from the port of *Puteoli* to the Portus Iulius, including the two suburban *vici*.

Recent studies carried out in the small inlet between the Nautica Maglia pier and the abandoned SOFER industrial plant have allowed us to refine the previous plan, which indicated the presence of structures with a low level of characterisation in this sector [25].

The conditions for carrying out a new underwater survey and documenting the remaining archaeological structures have improved with the gradual closure of almost all the industrial plants that have long plagued Pozzuoli's western coast.

The project immediately turned its attention to creating a GIS-based information storage system to use this valuable cartographic material and implement the results of the previous survey campaigns.

From a purely technical point of view [26], the definition of the architecture of the GIS database and the associated choice of software for its realisation were motivated

by various factors of no less importance, such as the nature of the existing and newly acquired data to be systematised, the need for extensive sharing of the same database between users of the different institutions involved in the project, and the ease of use by non-expert users, at least during the consultation phase. With these assumptions, it was decided to use the ESRI package, commercial standard and pillar in the world panorama of GIS software, in its form of ArcGIS Pro and, above all, in the correlated web package of ArcGIS Online [27]. This solution offers the possibility of easily creating geodatabases storing of archaeological evidence, which can, if necessary, be compiled during survey activities using mobile devices, thus ensuring continuous and shared updating.

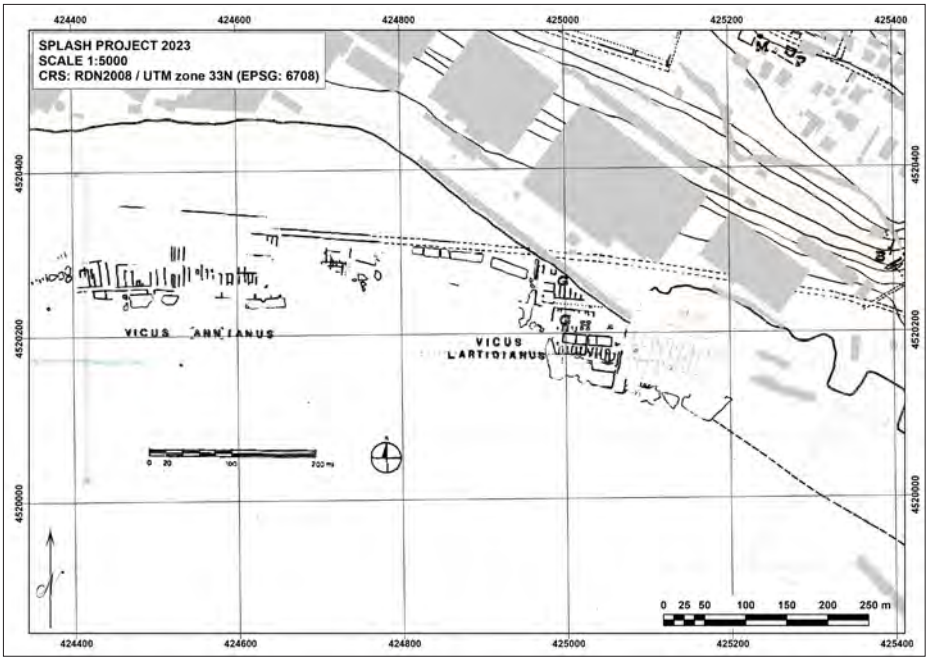

Fig. 2 - ***Geo-positioning of the plans by Camodeca (1994) and Lombardo (2021).***

Although it is still in the implementation phase, the project's new GIS database will be populated not only with the new acquisitions from the Puteolan shore but also by data from the immediate hinterland, from Lake Averno and Lucrino to Monte Gauro, in the wider area of the project's surveyed territory, allowing all the information collected to be related.

At present, the Camodeca plan has been georeferenced with a good degree of accuracy and, to a greater extent, the detailed plan prepared by Lombardo for the sector between the SudCantieri pier and the SOFER factory [28] (fig. 2).

In addition, the orthophotos taken during the new research carried out between December 2021 and February 2022, will serve as a reference for the underwater survey activities and the initial recovery and archiving of the archaeological evidence [29].

The potential of RPAS systems (Remotely Piloted Aircraft Systems) or UAVs (Unmanned Aerial Vehicles), more simply known as drones, and their increasing use in the archaeological field today, makes it possible to monitor regularly and document sites of interest [30].

In the case of the *Ripa Puteolana*, it was also decided to use various drones to carry out initial photographic and photogrammetric documentation of the area, taking advantage of the current phase of bradyseism. It should be added that our choice of method was also dictated by the need to ensure the sustainability of the research, which has just begun and does not yet have the resources to resort to more ambitious technological experiments potentially effective in the context being studied, such as acoustic remote sensing systems and, in particular, the multibeam sonar system already successfully used in nearby Baia [31].

During the initial trials, three different DJI drone models – Phantom 4 Pro, Mavic Air 2 and Spark – were used in free flight mode for archaeological documentation of the submerged structures, and in scheduled flights for detailed coverage of the entire area for photogrammetric purposes. Flights were periodically repeated in different light, wind and wave conditions to obtain the best possible results. Weather conditions were monitored using special apps [32]. The decision to periodically document the area in different environmental conditions between December 2021 and February 2022 is justified by a twofold objective: on the one hand, the possibility of observing the variations in the visibility of the submerged structures subject to currents and the consequent changes in the sandy bottom, and on the other hand, the desire to minimize distortions due to wave action and light reflection phenomena on the water surface [33]. These phenomena, in addition to reducing the visibility of the submerged evidence in the photographic images, have a profound effect on the quality of the photogrammetric restitution, where the geometric distortions due to the refraction of

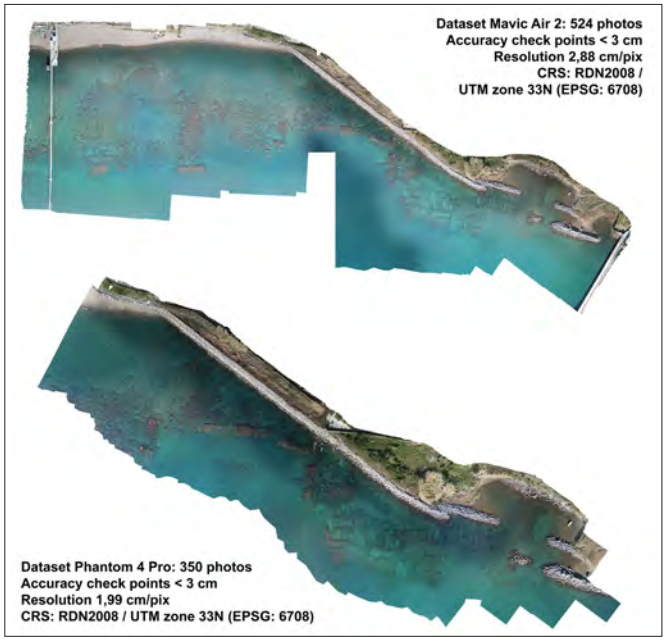

Fig. 3 - *Orthophotos of the* Ripa Puteolana *(M. Silani).*

the water already require the application of specific algorithms and rigorous control of the results [34].

For this reason, several sets of images were acquired, totalling over 2000 frames, and processed using the Agisoft Metashape image-based photogrammetry software. Geo-referencing of the photogrammetric models was based on eight cornerstones located along the cliff face and measured using differential GPS. The reference system used for the cartographic rendering was RDN 2008 / UTM zone 33N (EPSG: 6708).

At present, two orthophotos of the *Vici Annianus* and *Lartidianus* areas have been extracted, with a resolution of 2 and 3 cm/pixel respectively, and an accuracy of less than 3 cm for the reference control points (fig. 3). Although the orthophotos are well readable from a radiometric point of view and are therefore suitable for a first qualitative analysis of the buried structures and the relative cartographic restitution, it has not yet been possible to verify the

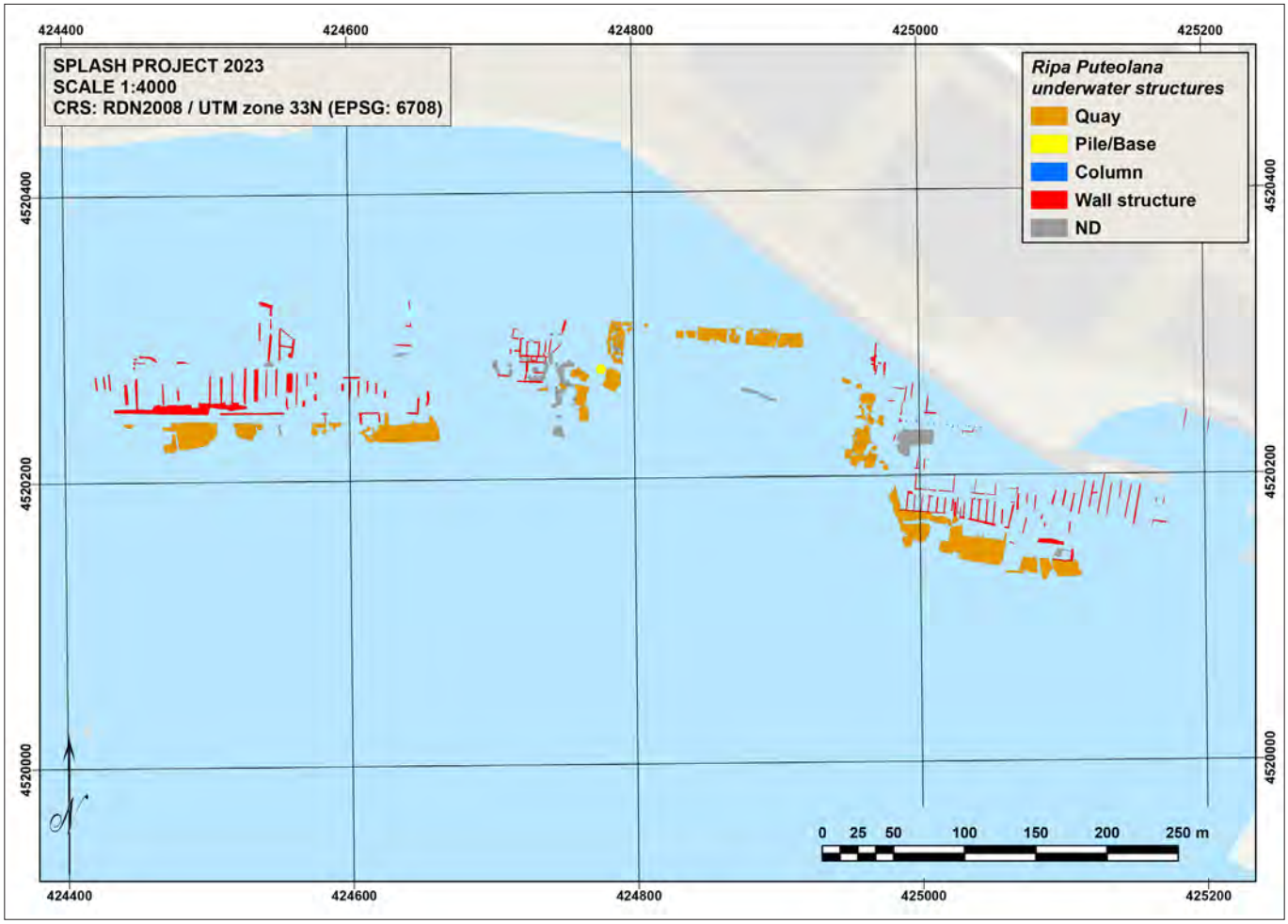

Fig. 4 - *Characterization of the underwater structures of the* Ripa Puteolana *(M. Silani).*

degree of accuracy and the average error of the parts of the orthophotos relating to the submerged archaeological structures using direct control measurements or DEMs obtained by other methods. However, a few findings from the first underwater survey activities have provisionally confirmed the compatibility of the photogrammetric survey with 1:100 scale representations [35].

As mentioned above, the orthophotos produced during the project's first phase were used to support the detailed underwater survey described in the following section and allowed us to return a first updated and interpreted plan of the underwater archaeological structures of the *vici Lartidianus* and *Annianus* (fig. 4).

(M. Si.)

Underwater activities. Preliminary remarks

Already in February 2022, while the drone survey of the entire area was being processed, an initial series of exploratory activities in the water began, through direct underwater surveys and through ROV exploration, with the help of a small wire-guided robot equipped with ultrahigh-definition cameras. In this way it was possible to proceed with an initial expeditious documentation of the entire submerged area of the *vicus Lartidianus*, and the first inspections were carried out in the eastern sectors of the *vicus Annianus*.

The research then resumed in May and June 2022, with a three-week campaign involving students from the Underwater Archeology Master program of the Universidad de Cádiz, with which a collaboration agreement was signed for practical training activities.

Intense surveys were also carried out in the submerged areas of the *vicus Annianus*, up to the modern limit constituted by the long Prysmian jetty, not far from the border with tme marine protected areas of the Archaeological Park of Campi Flegrei.

The first sector investigated was that of the *vicus Lartidianus* (fig. 5): in the western area of the *vicus*, the excellent state of conservation of the so-called *Portico delle Ninfe* (fig. 6) emerged, with 14 *piperno* columns (two of which, the 3rd and 9th from W, were pulled down by sea storms), with a diameter of 70 cm., aligned with an intercolumniation of m. 3.60, to form a 65-metre long

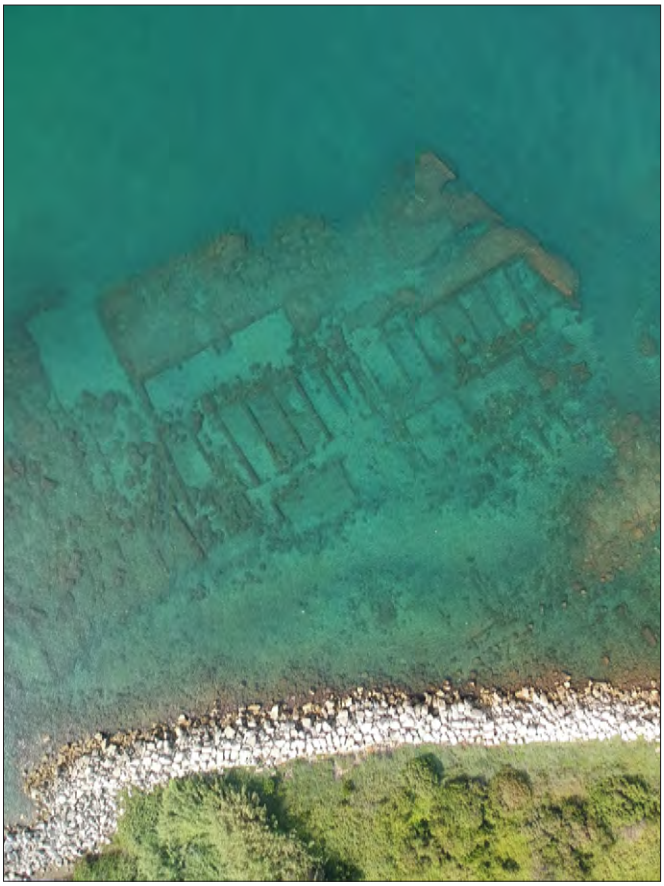

Fig. 5 - Vicus Lartidianus. ***Aerial photo (ph. M. Stefanile).***

Fig. 6 - ***The so-called*** **Portico delle Ninfe** ***(ph. M. Stefanile).***

porticoed line, interrupted, to the East, only by the overlapping of the modern cliff placed to protect the now abandoned industrial area of SOFER; at the western end of the colonnaded line, a massive head structure in large blocks, 40 meters from the current coastline and 16 m. from the ancient western edge of the quay of this part of the Pozzuoli port was documented. For a length of 21 m., the alignment of columns is clearly parallel (at a distance of 4 meters, reduced by the many collapsing elements) to a massive structure with evident reconstruction signs and a large, broken, entrance threshold, measuring m. 2.10 x 0.60: this is probably the building subject to underwater excavations in 1972 and interpreted as occupied, at least in one of its phases, by a workshop of sculptors [36], perhaps of oriental origin [37] as evidenced by a long series of fragments of sculpture, rough-hewn and unfinished statuettes, accumulated as fill below the most recent floor levels.

Just beyond the eastern limit of the portico, about 10 m. away, immediately close to the modern cliff, the survey activities also revealed the presence of a room which contained at least [38] two *dolia defossa*. The superficial cleaning of the interior of the *dolia*, awaiting a desirable underwater excavation, has shown how, at least in the upper levels, these containers are currently filled with sand mixed with fragments of white and colored marble and loose ceramic material, but also with considerable quantities of modern ferrous slag, linked to the disintegration of the industrial seawalls.

Fig. 7 - *The white layer on the floor of one of the* horrea *of the* vicus Lartidianus *(ph. M. Stefanile).*

Fig. 8 - *The Nabataean altar (ph.* Nucleo Carabinieri Subacquei di Napoli*).*

The exploration of the *vicus Lartidianus* then allowed to recognize the general articulation of the district, characterized by a double row of *horrea*, arranged parallel to the coast line, reinforced by massive concrete docks, and interspersed with large rectangular spaces (courtyards for the storage and sorting of goods?) and by regular systems of little roads; the standard shape of the *horreum* of this part of the port, identifiable in a rectangle of approx. 12 x 4 m, surrounding a storage space of 50 m^2, appears frequently altered, up to the formation of trapezoidal areas, according to the space available close to the docks. Where conservation is better, the internal perimeter space appears surrounded by plinths inclined at 45°, probably for practical reasons related to the goods to be conserved. In one case, the floor of the entire *horreum* appeared covered with a very white layer of lime, again linked with the type of materials to be kept (fig. 7).

Behind this dense agglomeration of structures for the storage of goods, it was possible to recognize a structure with reticulated walls, partially emerging from the sandy sediment and from a curious accumulation of large stones, in all probability to be identified with a corner of the Nabataean temple, now almost completely buried, based on the comparison with the images and films of the period.

An additional investigation made the identification certain thanks to the discovery, still *in situ*, of a large marble altar, next to one of the perimeter walls of the cell, characterized on the top by 8 rectangular holes for housing aniconic betyls (fig. 8): one more, therefore, than those present on the upper side of the so-called main altar found in 1965 in the same area and now exhibited in the National Archaeological Museum of the Campi Flegrei in the Castle di Baia [39].

On the other side of the *Ripa*, starting from the western limit marked by the Prysmian jetty, for an alignment of about 250 m, surveys were conducted in the *vicus Annianus* (fig. 9): this is a regular sector, at an average distance of 200 m from the current coastline, marked by the presence of an imposing quay line [40], for a thickness of 12 m, with the holes marking the lines of *catenae* and *destinae* for the construction phases, and with a series of traces of reconstruction and building additions which will hopefully allow us to outline the long sequence of interventions implemented to respond to the various stages of the Phlegrean bradyseism, in order to keep the port fully operational until Late Antiquity.

Behind the docks, this sector also shows the presence of long rows of *horrea*: in this case the buildings are narrow and elongated rectangles, measuring 27 x 6 m,

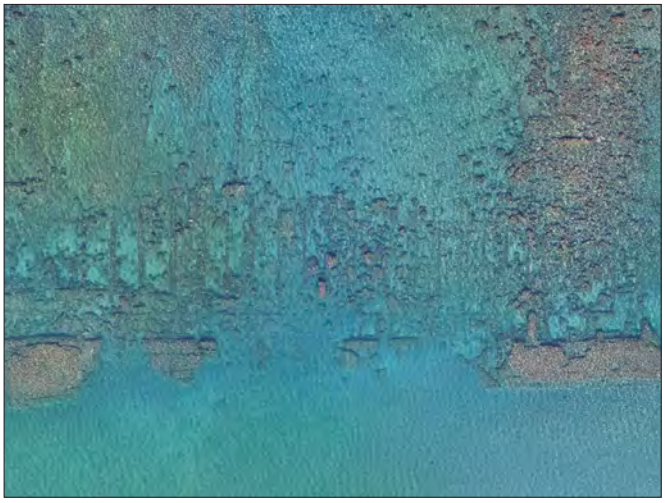

Fig. 9 - Vicus Annianus. ***Aerial photo (ph. M. Stefanile).***

surrounding a space of 170 square meters, that we maybe would need to double or triple, considering the thickness of the perimeter walls (1.20 meters, in the best preserved sections) and the testimony of the ancient sources, and in particular of the Puteolan archive of the *Sulpicii* [41] in relation in the presence of rented granaries, with two or three floors, capable of guaranteeing fabulous profits to investors who rented them to store grain purchased at low cost at the time of the arrival of the Alexandrian fleet, and to be resold at a high price in periods of shortage [42].

Due to the position of the *horrea*, beyond the sheltered area that was long protected by the bulk of the so-called Caligulian pier, the damage to the structures is considerable, with a dispersion of the elevations towards the coast which probably began when, submerged by bradyseism, the row of quays lost its function as a breakwater barrier.

However, the most surprising sector that came to light during the survey is the middle one: a peninsula, previously completely unknown and not reported in the scientific literature, lying at 40 m from the eastern limit of the *horrea* of the *vicus Annianus* and 165 m from the western limit of the buildings of the *vicus Lartidianus*: it is of an area which, extending about 50 m towards the sea from the ancient coastline, creates two at its sides small artificial bays, monumentalised, on the eastern side, by massive concrete quays, and on the western side by a long seafront of brick arches, found collapsed on the sandy bottom (fig. 10).

The entire peninsula (fig. 11) appears covered by buildings, occupied by a structure heavily affected by the storms but still able to show its ancient sumptuousness: white and colored marbles (with a notable frequency of

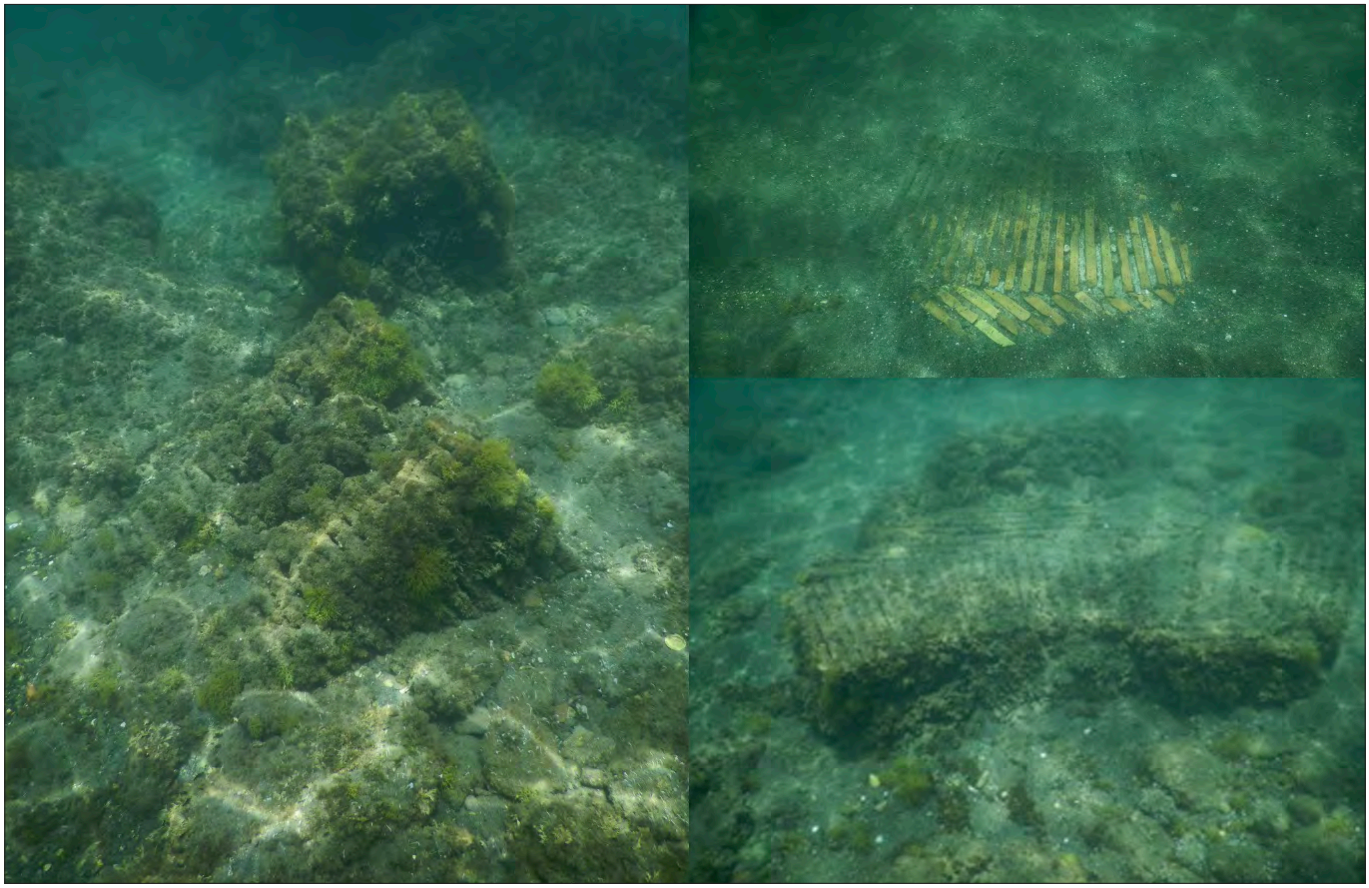

Fig. 10 - ***Collapsed arches of the monumental waterfront between the* Vicus Annianus *and the* Penisola Mediana *(ph. M. Stefanile).***

Fig. 11 - ***The* Penisola Mediana *(ph. M. Stefanile).***

green serpentine and African reds), *sectilia* from the walls still bearing their support clamps, nails and bronze elements appear scattered over a vast area, accumulating in the corners and in the shelters of the structures; in the eastern part of the sector, two large columns (one probably reused as a mooring bitt) and two twisted columns are still lying on the seabed, partially covered by the sediment, and seem to be able to be related to a curious pile with a perfectly hexagonal shape (on a side of 3.60 m), perhaps used as the base of a signaling monument, or a small colonnaded tholos, at the entrance to the eastern dock, immediately adjacent to a large element of docks where 5 steps of an access stairway are still perfectly visible.

Without venturing unjustifiable hypotheses in a still exploratory and reconnaissance phase, the median peninsula of the *ripa* seems to have housed an important building, linked to the administration of the port itself, and perhaps necessarily to be visited upon arrival of a cargo or a convoy, accessing from the stairway, indicated by the monument on a hexagonal base; only the continuation of the operations, already scheduled for 2023, will allow us to proceed in the interpretation of these monumental evidences.

(M. St.)

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Note

[1] On the Phlegrean archaeological landscape and its problems, see Cicala 2021, 21-30.

[2] Gianfrotta 1993; Camodeca 2018, with reference to previous studies.

[3] First aerial photos were made by Cocchiarella and presented by R. Bucher in 1957 (see Gianfrotta 1993, 116-118).

[4] Gianfrotta 1993, 118.

[5] Camodeca 2001, 97-98.

[6] Camodeca 1977, 75-80; Camodeca 1994, 112-113; Gianfrotta 1998, 166; Camodeca 2018, 179-181.

[7] Camodeca 1994, 112-113; Camodeca 2018, 61-66.

[8] An emblematic case is represented by the ancient pier of Puteoli, visible until the beginning of the XX century, then incorporated into the modern pier (see Dubois 1907, 260, Amalfitano *et al.* 1990, 122-125, Gianfrotta 1993, 122, Camodeca 2018, 176-179). Among the most important iconographic sources, we can recall the well-known glass flasks, found in various areas of the Roman Empire and datable between the end of the III and the IV centuries AD, of Puteolan production and of uncertain use, on which the representations of the ancient *sinus Puteolanus* are evident (see Ostrow 1989, Bejarano Osorio 2002, Popkin 2018).

[9] Gialanella 1993b, foglio IX, q; Camodeca 2018, 180.

[10] This datum has been confirmed also by recent research at *Vallone Cordiglia*, see Tardugno, in press.

[11] Ceraudo *et al.* 2001, 79-83; Crimaco-Gialanella 2003, 444-445.

[12] Sommella 1978; Amalfitano *et al.* 1990; Gialanella 1993a; Gialanella 1993b.

[13] Camodeca 1994.

[14] The extension of the harbour reached also the sud-east side of the *Rione Terra*, if we consider as a part of the system also the 65 massive piers built in *opus caementicium*, covering the entire promontorium to offer protection against the sea to the puteolan coastal structures (Stefanile 2021, Stefanile 2022).

[15] On the *portus Julius*, see Gianfrotta 2002 and Gianfrotta 2012.

[16] Camodeca 1994, Camodeca 2018.

[17] CIL X 1691 = EDR112147 (G. Camodeca, 394-395 AD); CIL X 1690 = EDR112150 (G. Camodeca, 394-395 AD); CIL X 1692 = EDR112143 (G. Camodeca, 394-395 AD), with reference to the works at the *ripa, a parte dextra et sinistra macelli, iactis molibus propter incursion ingruentium procellarum.*

[18] The names of the *vici* comes from the epigraphic documentation: see AE 1977, 200 = EDR076736 (a dedication to the Emperor Hadrianus by the *inquilini vici Lartidiani*) and AE 1977, 201 = EDR076737 (a dedication by the *inquilini vici [Ann]iani*): see Camodeca 1977, p. 77 and Camodeca 2018, 62-65.

[19] Camodeca *et al.* 2001.

[20] Lacerenza 1991.

[21] Some limited updates were made during a series of geophysic surveys.

[22] Demma 2010.

[23] Camodeca 1994.

[24] Camodeca *et al.* 2001, 95-105.

[25] Lombardo 2021, 69-86.

[26] Bogdani, De Mitri 2017.

[27] www.arcgis.com.

[28] Lombardo 2021, 72, tavv. I-II.

[29] See next paragraph.

[30] Minucci 2018, 91-114.

[31] Violante *et al.* 2022.

[32] Windy and UAV Forecast Apps were used.

[33] Imaging of the seafloor is often hampered by light reflections off the water's surface. Light reflected directly from the sun, often called specular solar reflection or glint, is very bright and often produces oversaturated image spots. Light from the rest of the sky and clouds is not as bright but can still mask the structure of the seafloor and adversely affect photogrammetric processing. Slocum *et al.* 2019, 25-27.

[34] Georgopoulos, Agrafiotis 2012, 173-180; Skarlatos, Saviddou 2015, 196-204.

[35] Topographic control surveys have already been performed to verify the results of the photogrammetric survey.

[36] De Franciscis 1973; Demma 2010.

[37] See the contribution by F. Demma in Zevi 2009, 138.

[38] With no excavation activities it is not possible to be more accurate, at the moment.

[39] AE 1971 = EDR075110; Lacerenza 1991.

[40] Stefanile 2021.

[41] TPSulp.

[42] TPSulp. 46 = EDR075472, dating back to march 13th, 40 AD, is particularly interesting, with the loan of a sum for the renting of the *horreum n. 26, quod est in praedis Domitiae Lepidae Barbatianis superioribus, in quo repositum est tritici Alexandrini milia modium decem et tria*.