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Archaeology of Soline Bay

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A Maritime Villa and Economy

Salt, in terms of cooking, is the all-spice, essential for many dishes. The smallest dash of salt turns a pot of brown water with meat in it into a beef stew. Salt has been used for centuries to cure meat and preserve food. Not only was salt used for food preparation and preservation, it was used in working precious metals, during mummification, in fertilizer, and it was even used to pay soldier's salaries. Salt was a commodity and a lucrative trading item throughout the history of the Mediterranean cultures. Roman Domination of the Mediterranean did not change this fact. The Romans needed salt just as every other culture in that region needed and used it. There were numerous salt works in the Mediterranean and nearby seas. In the Roman era there were salt works that were private enterprises and, as with many other businesses and commodities, there were many state owned salt works. Salt was a needed good within the empire so even the private salt works however had a monthly quota to fill for the Roman government. Still to own a salt works was a profitable business adventure. There is one such private salt works located on an island in the Adriatic Sea off the coast of Croatia in the area of ancient Dalmatia. The island was named after the Roman period for the Catholic Saint Clement; as such the name is St. Clement or the corresponding Croatian Sveti Klement. It is at a very logical and frequented stop along the trading routes of ancient Rome. Many of the ships in that time would travel south along the Italian Adriatic Coast and then

return coming north along the Croatian Adriatic coast. There is one bay in particular on the island that is protected from winds and waves from every direction. It is said to have a higher salinity than other areas in the sea and is aptly named Soline Bay. For the reason of this high saline content there was a salt works constructed in this bay adjacent to a Roman villa. This salt works was constructed during the period of the Roman Empire and it was in use through the middle ages. It was in this salt works that I conducted part of my work and research for the archaeological project on the island. I also assisted with the excavation of the main project on the island which is of the Roman villa adjacent to the salt works. The main goal of my project was to show how a single production unit, in this case the salt works, fit into the greater scheme of Roman regional economic specialization.

Villa Excavations

In order to achieve the main goal that I set forth with I needed to create many smaller goals that would all contribute to the ultimate goal. These were just small goals, some were very easy and some sounded easy but were in fact extremely hard. First I will explain the goals of the project as a whole. This will give insight in the work on the salt works and help understand what other work I was doing. The main excavation of the site, the villa, had three visible features; one, building A, is a structure with a main room enclosed by three walls about 2 ½ m high and three smaller rooms on the north side of the structure. The second feature, building B, is a single freestanding wall around 20 m north of building A. The wall was a little over 15 m in length and is about 2 ½ m high on the west side and 2 m high on the east side. The third feature is a structure that is immediately adjacent to the salt works at an angle slightly off

perpendicular to the edge of the water. The structure is around 6 m in length and has two buttresses evenly spaced that are each 1 m x ½ m. The goal for building A was to excavate on the east side of the building to determine what is there. This work took us the better part of the first week. We dug down to the bedrock and exposed three separate walls. The first we found was perpendicular to the outer wall of building A, then we found a wall parallel to the outer wall, and finally we found a wall that started perpendicular from the end of the wall that began to curve towards building B and the rest of the villa. My work on this excavation included clearing the area of plants and large rocks to enable digging. Then naturally I helped the digging, using mainly medium sized pickaxes and trowels. Throughout the digging the workers would switch between digging, shoveling and sifting through the removed dirt. The largest part of what I learned by myself during the project was from sifting through the removed dirt and learning how to determine between pottery, remains, artifacts, mosaic tessarae, and rocks (which are very deceiving). Through a lot of trial and error and with much help from Dr. Schrunk and some other more experienced workers I learned how to determine not only whether it was pottery but also (in many cases) what kind of pottery it was and (sometimes) when it was produced. In those first days I learned most of what I came away from the dig with about identifying pottery, though throughout the other excavations at the site I never stopped learning more about how to identify the pottery. I also learned in that first dig to never overlook any piece no matter how small or seemingly insignificant. While digging one day I noticed a very small black item. I at first disregarded it then upon further contemplation I brought it to one of those more experienced workers and through further tests

(holding it up to a compass) found that it was metal. We found later that there were many more pieces much like this one and many that were much bigger. They seemed to fit together and make up an item that could have possibly been a medieval sword or bayonet. From then on I learned never to overlook anything, no matter the size, shape or look. We were unable to continue excavating the curved wall because of exceedingly thick vegetation and time constraints in removing it. The next goal we tried to achieve was to excavate to the west of building B to discover whether there were any walls present as shown by a magnetometry taken in a previous year. The first trench we dug was 1m out from the wall by 2m along the wall starting 1m from the north end of the wall. After we had completed this first trench we expanded it a further 1m out from the wall. We found various pottery sherds while digging but nothing conclusive until we finally reached the bedrock without any major finds, though this did tell us that the wall went all the way down to the bedrock. With the wall continuing all the way to the bedrock we can determine there was no floor and therefore that it was not an interior of a building. This seemingly unfruitful excavation taught me that there is always something to learn and take from an excavation. We learned from this dig that there were no walls perpendicular from that spot and we learned that there was no previous building that the Romans built upon. We also determined the exact technique of the wall construction, which I helped to measure while an architect drew the wall with exact measurements and locations of stone blocks. This information helped us to try and determine what the wall could have been for. After we dug that trench we started on a trench 1m x 1m off the end of building B. In this trench we dug around the end of the wall to expose it completely and determine whether it

continued. We found many miscellaneous pottery pieces but later found that most of it was fill from an earlier excavation, this included a large curved piece of ceramic that was most likely used in a radiant heating system. Even though, because it was fill, this piece was not originally located in this spot we know just from it being there that there was a system somewhere in the villa. Approximately at 1 m depth we found two walls that came to a 90 degree corner off the end of building B with one of the walls a very slight change of angle from the orientation of building B. The construction of the two walls we found seemed to be older which leads us to believe that at one point someone tried to build an addition, building B, off of a structure. It was while I helped to clean of these two walls for the pictures that I truly understood the meticulous care that goes into an excavation. I would spend more time picking off the dirt and mud that covered the tops of the walls that it took for me to dig the meter down into the earth. One thing that remained constant throughout the whole excavation was that I constantly learned new and better ways to achieve a task. Whether it was a better way to sift, or a better tool to clean with, or the best way to pull weeds, I was always learning and changing. The final goal we wanted to accomplish for the villa site was to excavate towards the salt works on the third feature to determine whether it continued or not. I personally did not do very much at this site because I was working at the other areas, but I did help a little. The workers who excavated on the side of the salt works did find that it continued towards the works but they were unable to go very far because of the condition that the wall was in and they were constantly thwarted by the rising tides that would fill the area with water. When I came to help I worked on the other side of the feature. I dug around the end of what was visible and we

found that the wall also continued in the opposite direction. Again we were unable to conduct any further excavation on this end because of time constraints. While digging in the area I uncovered organic remains (bones). Immediately I jumped strait to the conclusion that we had found a burial. We had uncovered a hip bone and an extremity of some sort. From the placement of the bones it was obvious that whatever (or whoever) was buried there would of have to have been curled up or in a heap. The finding of these remains was the last work I did at this site before having to fill it to protect it. Later we concluded that the bones are most likely some sort of medium sized animal bones, like a sheep, but I still hold out the hope that it could be human remains. This site taught me that no matter how much planning and preparation there is we are still at the mercy of geology and nature; the constant flooding of the site hindered our process greatly. I also learned that the purple dye of a cactus flower is very hard to get out of clothes!

After we had finished with the excavations for the day and during the abnormally often days it was raining, we took up our toothbrushes (not the same ones we brushed our teeth with) and set to washing pottery sherds that we had found. This is another of the jobs that is included in Archaeology that you never see Indiana Jones do. It is very time consuming but yet still very important. Many of the designs and features of the pottery could not be seen without the washing. It is these moments that I thought of when I was washing those pottery pieces that seemed to never wanted to get clean. Yet it was also at this time that I learned a great deal about identifying pottery types and actually putting terms like slipware and fine-ware to the pottery itself. It was also during this time that I was better able to place where the pottery

came from by the types of items the sherds were part of, i.e. North African amphora versus Greek/Byzantine amphora. Though I may not have enjoyed the washing as much as the actual excavation I came to realize that it was necessary and important all the same.

Salt Works

The final goal of the project was also part of my main goal; that was to investigate the salt works and try to determine where the walls were and the size of each singular chamber. This was one of those things that sound much easier than it actually was. The salt works were covered in mud and debris that had built up in all the years since it was in use and tended to. I tried, at one point during my work, to reach the bottom of the shallowest chamber yet I could not reach it with a meter long stick. On top of that mud which is over a meter thick at the shallowest point, there is about meter deep water which also increasingly becomes deeper as you move toward the bay. The work of finding where the walls were was not exact yet still accurate enough to be confident in. The ends of the walls were much easier to discover than the middle so I started by using the bird's eye view photo to establish possible starting points. Then I would search the areas that indicated where a wall could have begun. In concurrence with the aerial photo I was able to establish very accurate starting points for each of the walls. At these points there were many more large rocks, pottery with mortar, and some possibly shaped rocks. After I had established these points I walked across the salt works trying to trace the remains of the ancient walls. I was able to determine whether a wall could have been there by walking the line between starting points and I could tell if I moved off of the line by where I would sink into the mud. The ancient walls have less mud build-up and therefore I would be

walking on much firmer ground when I was in the bay. I did this for all of the walls except for the outer wall because there was not as much mud built up and it was too deep. To follow the line of the outer wall I used a snorkel to float above the line of the wall (and the plethora of sea urchins). This was also the method I used when searching the area for artifacts. Most of what I found when doing this was mortar fragment and pottery sherds with mortar on them. The area has been snorkeled by centuries of tourists and I believe that many of the artifacts that were there have been taken. The innermost wall was the hardest to determine but the other walls had many more large stones still in line with the starting points of the walls. The constant movement of the water caused the walls to have fallen apart and scattered the rocks. It is because of this that the measurement of the widths of the walls could not be exact. I would need to completely clear the area of mud to determine the exact width of the walls, and I did not have the equipment or the time to do so. After I had established the location and orientation of the walls another worker and I measured the distances between the walls, the approximate widths of the walls, and the length of the walls. The innermost chamber was 32 meters long on the south side and 33.8 meters long on the north side enclosed by a wall 65 meters in length. The next chamber is 22.1 meters on the south side and 22.8 meters on the north side enclosed a by a wall 68 meters in length. The next chamber was the smallest with the south side measuring 20.3 and the north side measuring 13.3 enclosed by the third wall with a length of 74 meters. The final chamber's south side is 24.8 meters long and the north side is 23.5 meters long. The outer wall of the salt works is 76 meters long and has a 3 meter opening 29 meters from the north edge. The first and thirds walls are roughly 3 meters in

width while the second wall is approximately 4 meters in width. The outer wall is the widest at 6-7 meters in length. Through my investigation I was able to learn that the outer wall was much larger than the inner walls and I was also able to determine where the opening to the bay was in that wall. From the thickness of the wall I believe that it was used as a pier as well. Soline Bay itself also supports this idea because it is a protected bay; it is the perfect location to moor or dock a ship. The pier would not have been large enough for ships much bigger than a skiff however. The work I did on the bay gives us a solid idea of the structure and size of the salt works, which was previously just guessed at. I had higher hopes for this project when I started it; I had hoped to be able to determine the depth as well and with that I could have calculated the capacity of the salt works by using the water levels at the time. Even though I was not able to do all I wanted to do I was still happy with what I was able to accomplish.

Roman Regional Economic Specialization

The salt works on this island were just one of many individual production facilities in a grand scheme of economics that incorporated the entire Roman Territories. The Romans controlled a vast area with a great diversity of landscapes and weather conditions. These regions with such different climates had comparative advantages over each other and other regions. Egypt for example, could grow wheat much easier and with more plentiful crops than Dacia. The Romans were able to do something unique because of the diverse regions that were under their control. They were able to utilize the strengths of the regions and bypass areas of weakness. If a certain region was well-suited for raising flocks but it did not have the

capabilities of harvesting crops, the Romans could appropriate most of the regions resources for raisings flocks while they had another region which was efficient and plentiful in harvesting crops appropriate most of their resources to that and then transport what was needed into the areas that had deficiencies. With this system the Romans could produce the most of a resource or crop at the highest efficiency rate. Kingdoms before and after this were not able to do this because they were limited by the climates within their kingdom, forcing them to trade for essential goods. The Romans could acquire all their essential needs within their territory and only needed to trade for luxury goods. The Roman system of transportation over land and on the seas contributed greatly to the success of this system. Their roads allowed for fast travel over land but it was their control of the seas and the regulation of sea travel that allowed for products to be shipped all over the territories. From Diocletian's Edict of Prices we know that sea travel was common and that the routes passed through all regions of Roman control. Passage from one region to any other was charged by actual distance traveled on the sea and the prices were regulated by the government. The Romans knew the exact distance of boat travel and could get any resource to the area in need in sufficient time.(Arnaud 323-330) Within the different production regions many of the farm/manufactories were privately owned. The government would set quotas on their crop and through that they would have what they needed. The rest would be for the owner to trade as he wished. Through this system of regional economic specialization the Romans were able to sustain a successful economy lending to the longevity of their dominance. In Dalmatia, the people relied on a maritime economy and one aspect of that is the harvesting of salt.

The salt works on St. Clement was just one in a system of many that dotted the Dalmatian coast. Though seemingly unconnected each was part of a system in Roman economics. The St. Clement salt works shares a similarity to these other ones more in purpose rather than in size and shape. While the general structure of a salt works was similar, it allowed for a lot of variation to the essential form. Every salt works had a series of chambers that would decrease in depth to allow for the accumulation of brine and later collection of salt. The designs of the chambers range from the simple, as in the St. Clement salt works, to more intricate, like a salt works in the Brioni Archipelago which has the main channel run down the middle and the chambers circle around it.(Begovic & Schrunk, 2007, 31-33) The various designs of the salt works reinforce the idea that most of the salt works were privately owned because there was no uniform standard of which to build. Also the high quantity of salt works in the area is more evidence of the area specializing in salt production.(Colivicchi 37-38) The fields around the villa on St. Clement were and are still used today for growing crops. Yet these fields were not nearly large enough to grow commercial goods to trade and sell. They could have possibly made their own wine (as some on the island still do) yet it would have been likely that they only produced enough for personal use on the island. The only truly profitable trade from the villa would have been the salt works. On top of that the salt works in the bay is of a medium size when compared to other salt works from the area that I found; there are some larger yet there are more that are the same size or smaller. The quantity of salt harvested from this works would have given the villa enough to sustain themselves and have some left over to trade. The salinity of the Adriatic on average is 3.8%. This means that in every kilogram of

Adriatic Sea water there is 38 grams of salt. ("About Croatia", 07/09) Keeping in mind that this is the average salinity and that the salinity is known to be higher in the areas starting in southern Croatia and further south, the salinity in the area of St. Clement would have an even higher yield than that. Furthermore Soline Bay, where the salt works is located, is known to have an even higher salinity than other area in the region which means that this particular salt works was placed to yield an extremely high amount of salt.

Salt was a sought after commodity and the production of it was necessary. The salt works on the island of St. Clement fit perfectly into the grand roman scheme of regional economic specialization. The work I did on the island and in the salt works, in conjunction with primary and secondary sources, helped to show exactly how it fit into the system that was essential to the longevity of Roman dominance. The investigation of the bay confirmed previous beliefs about the bay and the construction within as well as discovering new things about the salt works. The knowledge gained while helping in this site's excavation was invaluable and I could not have gained it without the experience.

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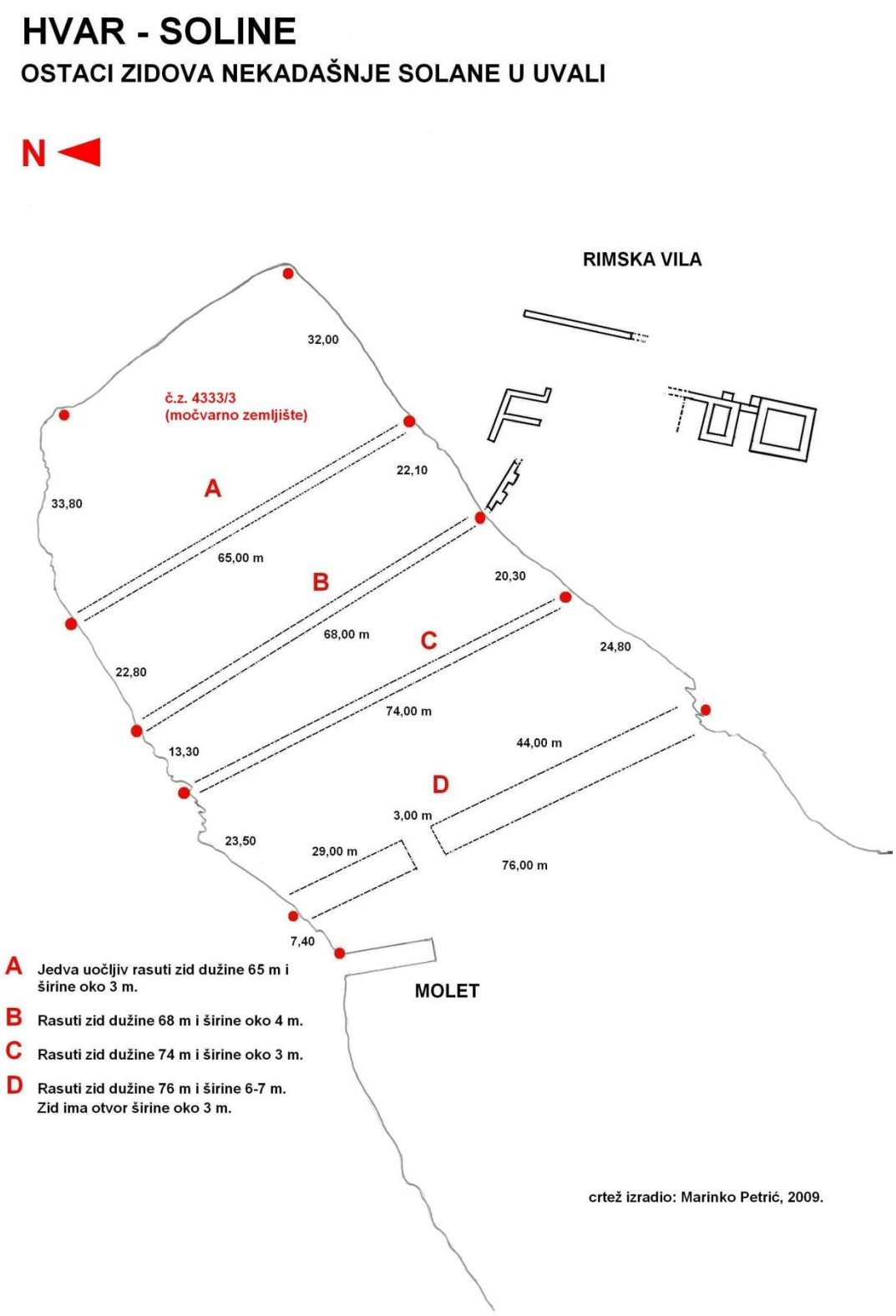
Appendices


HVAR - SOLINE
OSTACI ZIDOVA NEKADAŠNJE SOLANE U UVALI
N
RIMSKA VILA
32,00
č.z. 4333/3
(močvarno zemljište)
A
22,10
33,80
65,00 m
B
20,30
68,00 m
C
24,80
22,80
74,00 m
13,30
44,00 m
D
3,00 m
23,50
29,00 m
76,00 m
7,40
MOLET
A Jedva uočljiv rasuti zid dužine 65 m i širine oko 3 m.
B Rasuti zid dužine 68 m i širine oko 4 m.
C Rasuti zid dužine 74 m i širine oko 3 m.
D Rasuti zid dužine 76 m i širine 6-7 m. Zid ima otvor širine oko 3 m.
crtež izradio: Marinko Petrić, 2009.