Learning How to Map 70-Tons of Marble

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A summer working on the Roman shipwreck at Kızılburun, Turkey, was an opportunity that I was not able to turn down. While coping with the challenges of diving to a depth of 150 feet twice per day, I was simultaneously exposed to the art of excavating under water, the transport of artifacts from the seafloor to the field conservation lab, and the various levels of recording. Even before the first fin hit the water, I was interested in the mapping techniques utilized on previous INA shipwreck excavations in Turkey, and was eager to learn how underwater procedures compared with my experiences in terrestrial site recording. INA staff member Sheila Matthews, who has employed and refined digital mapping techniques for the shipwreck excavations at Tektaş Burnu, Pabuç Burnu, and now Kızılburun, became my instructor.

For the past seven years, INA archaeologists have been using two software programs, *Site Surveyor* and *PhotoModeler*, in tandem to map a given site. The first step in this process is to establish "control points," or fixed datum points, around the site; at Kızılburun they are either freestanding weighted steel towers or metal spikes driven into the surrounding rocks. One of the control points is established as the primary control point; heights of the other control points are determined in relationship to this main point of reference. Divers also record the distances between points with measuring tapes. These data are uploaded into *Site Surveyor*, a computer program which calculates the positions of the points using trilateration. If the distances between the control points are inaccurate or problematic, the program highlights it and the divers re-measure it. Since the relative provenience of all artifacts is based on the network of control points produced by *Site Surveyor*, the accuracy of the measurements is of prime importance.

In order to map artifacts with *Site Surveyor* all of the artifacts would have to be measured to the control points. Since this is a time consuming process, artifact provenience is plotted in *PhotoModeler*. By using digital photos of the site taken by divers every one or two days the artifact sizes and relative distances between them is calculated by the program. The lengthy process of plotting the artifacts consists of identifying and marking several discrete points on a given artifact in at least three photos taken from various angles. In order to easily identify the same discrete point in each photo, brightly colored mapping pin flags are placed at the center of each artifact prior to mapping photos being taken. Each photo must include at least two of the one dozen control points (either towers or stakes), which are also marked and correlated among a selection of different photos. As stated earlier, *PhotoModeler* only provides relative distances. In order to obtain the artifact co-ordinates, the distances generated by *Site Surveyor* are assigned to the plotted control points. Every artifact was mapped in

PhotoModeler and numerous rough maps were created for each zone of the site as the excavation progressed. Eventually, the smaller maps, comprised of artifact points, are combined to create an overall site map that appears on page 3. The artifacts that appear on the site map were created by means of a 3-D modeling program called *Rhinoceros*®.

Among the professionals who visited us at The Kızılburun last summer was the creator of *Site Surveyor* program, Peter Holt of 3H Consulting Ltd. Peter and 3H's chief trainer Sarah Ward dived with us for one week at the beginning of August to observe our techniques and introduce the newest version of the program, *Site Recorder 4,* to our project. The new version is the next level of mapping after *Site Surveyor*, produced by 3H Consulting Ltd. It is a Geographic Information System (GIS) specially designed for underwater and intertidal sites, and features not only mapping capabilities, but also the possibility of storing, retrieving, and linking artifact and personnel records associated with the project. Previous versions, specifically *Site Recorder 3*, were used on numerous projects including the 2003 *Mary Rose* excavation project. *Site Recorder 4* is the first version which is designed specifically to be able to record a site in its entirety.

Some of the features of *Site Recorder 4* were demonstrated to team members using the data we had gathered to date. We were able to transfer not only our control points from *Site Surveyor*, but also the artifact coordinates produced in *PhotoModeler*, photo mosaics, and hand-drawn sketches of environmental features. By placing different types of data on different layers, viewing them individually was as simple as a click of the mouse; we were able to see the results of two seasons of excavation simultaneously as well as independently. Overlaying the 2005 photo mosaic with one taken in 2006 made it possible to appreciate how much the site had changed, owing to the absence of the stelai and marble blocks upslope as well as the four column drums removed in the course of the summer.

In order to organize the thousands of digital photographs, dive logs, a daily journal, team member profiles, and artifact records that accompany a project of this scope, the Kızılburun team relies on a relational database designed by TAMU graduate student Heather Brown using the *FileMakerPro* software. *Site Recorder 4* not only has the capability to store this information, but also the ability to associate or link it to other data or artifacts and the site plan. By selecting the artifact's location on the map layer, all of the associated information can be viewed, such as photos, date of discovery, the diver who found it and the like. While the Kızılburun project is currently using two different programs to store these data, *Site Recorder 4* should make it possible to have all the data in the same program.

For me, working on mapping every day for hours at a time highlighted the importance of looking at the site as a whole, as well as relationships of individual artifacts within it. The meticulous and time-sensitive nature of underwater work often makes it difficult to appreciate what others are uncovering or how the environment might

be affecting the artifacts found. When I looked at the whole map with its layers married together, patterns and questions arose relating to topography, the orientation of the drums, and artifact distribution, both vertically and horizontally. As the Kızılburun excavation continues in the summer of 2007, I look forward to learning more about these spatial relationships and theorizing about the reasons for their existence.

To see more on the Kızılburun site visit http://ina.tamu.edu/kizilburun/ or to learn more about the use of *Site Recorder 4* at Kızılburun check out http://www.3hconsulting.com/SitesKızılburunMain.htm.

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