GIS and Remote Sensing in Shipwrecks. Focusing on Dead Sea, Red Sea and or the Mediterranean.

Abstract:
Throughout time people have been using the water as transportation, and have been sailing across the ocean; but in turn this means that there have been loses. Shipwrecks are inevitable when sailing, especially when sailing technology was not what it is now. Some people say that the Mediterranean and the countries surrounding it was the hub of civilization, the shipwrecks of the area tend to be older, and therefore there are not a lot of parts left of them. GIS and Remote Sensing has opened up a whole new world in looking at shipwrecks of all times. When looking at older shipwrecks from the ancient times of the Greek and Romans it maybe harder but GIS and Remote Sensing still bring ships into light that otherwise would be left in the darkness of the water.

There will always be a large gap between the ancient world and the modern, but with looking at ancient shipwrecks archaeologist a get a sense for the ancient world. Shipwrecks that are found can tell archaeologist a lot about life in the ancient days; for example archaeologist can see what the ship was transporting, where it was most likely going and coming from, who owned the ships, the general economics of the time of the ship and the hierarchy of how ships were during that time. People may question as to why all of these things are important to modern day, but some trade routes that were in place in ancient times are still used. In the United States 51% of imports and exports are done through vessel transportation all over the world (Chambers, M., & Liu, M); knowing why a ship may have no made it through a certain part of the ocean is still very much relevant into todays economy.

Location shipwrecks can be very hard due to the fact that there is an ocean barrier, but Remote Sensing helps people see through that barrier. With using Remote Sensing the heat signatures, and the signatures of the different materials can be seen with Remote Sensing, even through the water barriers. When wrecks are within the commercial diving range it does make it easier for divers and archaeologist, but there is still a time constraint. When dealing a submerged site it takes a lot of time, and when diving this is the biggest boundary. With Remote Sensing and GIS it removes this boundary, also it helps when the wrecks are beyond the commercial diving limits; it provides an easier way to fully understand the site.

Another method that is used to located and map wrecks are ROVs (remotely operated vehicles). These are just another way to break the deeper boundary of deeper exploration, they can stay down at depths that the human body cannot with stand. The ROVs are also able to stay down longer and film and map the wreck at the same time; they can send the data they collect almost instantly to the surface. It is important to know how to use all of these methods together; together they can build up the knowledge of the ancient shipwrecks, and build the foundation of history.

With GIS, Remote Sensing, and ROVs put to all together it will build a database, and that can be used both by professionals and the public. The public needs to have a chance to understand what is being found, over the past years the discoveries of shipwrecks a lot of the publications are only in professional journals. The public most likely does not read they for they are long and complicated and filled with professional jargon, with the use of GIS to
create maps people can look and understand the wrecks that are being found. Maps that are created with GIS can be seen and understood by the public to help spread awareness of shipwrecks to there can be a future for maritime archaeology.

Annotated Bibliography:


This article is interested in when Remote Sensing is used to locate shipwrecks. When LiDAD is used a lot of the times the water needs to be very clear and the depth of the water can sometimes cause problems as well, but during this study it was found that Landsat-8 was able to detect the ships. This was because the ships had Suspended Particulate Matter (SPM) and Landsat-8 was able to detect this. The wrecks has SPM up to 4km from the wrecks and the archaeologist were able to track the levels has they got high to the wrecks. The Landsat was able to detect the different amount of sediment, and in the pictures that were taken with the Lansat-8 it can clearly be seen that there was something causing the sediment change and it pointed to a focal point area. The amount of sediment that could be seen was depending on the tides, for example at slack tide there was a higher reading of sediment. The Scientist it was due to the fact how the water moves around the wreck. Even though this does not point directly to the wreck it gave the archaeologist a smaller area to search, and this is extremely helpful.


This article may not seem to deal with shipwrecks directly, but indirectly it deals with much more than the lowering of the Dead Sea. Remote Sensing has been used to map the Dead Sea, and to map the lowering in the Dead Sea levels around the shore. The Dead Sea has 9.6% more salinity than the average ocean; this means that the wrecks that are in the Dead Sea are much more persevered. With the Sea level lowing there is a chance that wrecks that have not been exposed to oxygen in decades would then start to erode due to the decease in the sea level. Using Remote Sensing to get aerial photos and GIS to map the Dead Sea as it changes shape due to the level of the sea lowering. With continuing to monitor the decrease in levels then archaeologist and scientist can try to predict where the levels will lower the most, and to see if there are any wrecks within the area and try to protect the wrecks. With this article it can be seen that even when the GIS and Remote Sensing is not use directly used to locate ships, it can still help with the preservation of the ships and to show the public the greatness of the old world ships.


This article deals with wrecks in the Mediterranean wrecks and how different types and combination of different Remote Sensing can be beneficial when trying to locate and map wrecks. This article goes into not just looking at shipwrecks but also other archaeological sites that have been submerged underwater. When looking at the ancient wrecks the archaeologist, they are mostly looking at what the ship has left behind, usually the timbers have rotten by then; this technology can spot the anomalies on the ocean floor. The technology that find these items most of the time is sonar, so the signals that are sent
are then bounced back off of the item and then sent back to the device. Certain sonars can even 3-D map an object. Throughout this the authors talk about all of the different types of sonar that can be used when trying to map wrecks and submerged site, and how they all work in the water; including clarity and depth when they go through their case studies.


This article discuses how Remote Sensing was used in a deep-water wrecks off the coast of Israel. The wrecks were found at 400 meters by a U.S Navy submarine, but it was not the mission of the submarine to gather information on the wrecks; the only information they gather was the location. The main method that was used was ROV (remotely operated vehicle), and side scan sonar; this was because it deep water wrecks. The sonar that was used was able to spot the wrecks and the sites, it mapped out through the sonar. The ships that were found contained a lot of steel from chain and anchor; these objects were picked up by the sonar due to their dense materials. It was interesting to see that even with the remote sensing being underwater, the ROVs still followed the same type of aerial pattern a plan would in the air. The patterns that were used were determined on the area that the US Navy gave the research team, and this is how they found the wrecks.


This is a website article about a medieval ship in that Black Sea, the key note that the author hits on is that this ship might show archaeologist old trade routes. Because of the lack of oxygen in the Black Sea it means that the ship was well preserved and didn’t have animals eating the wood. Because of the lack of oxygen down at the wreck not only was the ships wood well preserved but there were still ropes that were intact on the ship; this all could be seen through the ROVs, they give the archaeology an eye into the deep waters. The wreck was placed at the bottom of the Dead Sea, which quit deep, and to map and look at this wreck ROVs on to the site. These ROVs were able to map this wreck and produce amazing images f the ship, but while they were down there, the ROVs and the archaeologist found 44 more ships from all over the ages in relatively a small area. Most of these ships were involved in the trade industry of their time, whether or not that is during the medieval time or up to the 18th century. These wrecks are a perfect example of how shipwrecks can map out the ancient trade routes, and help people understand the area and how the history plays into modern times.


This article talks heavily about GIS and Remote Sensing, and how it can monitor wreck sites and the Dead Sea over time to see how they are being preserved or how they are degrading. This site was monitored between 1972 from 2013, in the Dead Sea. As the project progressed the Remote Sensing methods changed and became more sophisticated and was able to get higher quality numbers about the sea level lowering. The scientist found that every year the volume of the Dead Sea was lowering by 0.42km³, and this was done by monitor by the Remote Sensing and GIS maps that had been created over the year of the project.

This is a thesis from a student at the Texas A&M University, she main idea is that GIS is the perfect tool for locating and deciding to excavate wrecks. It is talked about that even though a wreck might be found, that not all wrecks need to be or should be excavated. Some wrecks are not worth the time or the money of an excavation due to the lack of information it may provide, or in some cases the wreck is much too fragile to be disturbed. Rooney goes into talk about five different tasks that GIS helps accomplish in archaeology; spatial data acquisition, spatial data management, database management, spatial data analysis, and spatial data visualization. The part it very interesting, because it is not a point that is brought up a lot in most professional articles, and that is showing the data to the public and to other methods that deals with interaction of the wreck even above the water. With the GIS software it is able to transform the data into a 3-D image or a format that the layperson has a chance to understand; but at the same time it can be formatted for professionals as well. This thesis shows how diverse GIS software can be for many fields and it also shows how GIS will be used more and more in the future for maritime archaeology.


This article talks about how it is still very much relevant to understand the ancient trade routes of the Mediterranean. Leidwanger states that it is important to understand the seafaring culture because it will help us understand the reason they traded and why they traded where they did through out the Mediterranean. The case study that was done was done on an ancient Greek ship off the coast of what is turkey, and it helps understand the colonization of both the Greeks and the Romans. Much of the research that was done was based on the old maps and texts about the winds and the ships, and the modern winds; for much the wind patterns from ancient times have not changed. With excavating the two ships that were found off Turkey archaeologist reconstructed the ships as best as they could, and this than aloud for them to create maps that show how far the ships could possible traveled. Then using the known trades winds another map was created and then it was over lapped to see how and why the ancient seafarers traveled and trade where they did. This article was able to show how GIS was able to take ancient and modern data, and ancient data and compile them together to map one maps in unison.

Citation: