Geochemical survey of potential archaeological sites on an island in Lake Vättern, Sweden

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Introduction

Vättern Island in Sweden’s Lake Vättern has had continuous settlement since the Neolithic, playing a vital role during the intense political change of the iron-age and medieval times. The dynamic history demonstrates great potential for archaeological research and is demanding further research. Identification of potential archaeological sites on a minimal budget is important for preservation of heritage and future research. The goal was to create a geographic regional map of using simple reconnaissance techniques. A combined approach using geophysical analysis and Geographic Information Systems was used to develop a geographical map of potential archaeological sites on Vättern. Soil samples were collected systematically according to GPS coordinates using a 30cm soil auger. The phosphate levels were analyzed qualitatively using the Eidt method which provides accurate archaeological site identification. Phosphate, a chemical marker of human occupation, is also being selected for its slow rate of degradation, proving a vital asset to archaeological analysis. The qualitative spot tests of phosphate geochemistry ranks tested samples on the scale of 1-2, 1-4, and 5 indicating the most indicative of past human occupation. These values were entered in GIS to produce a geographical model of the potential sites on Vättern. Such a product is important for the preservation of archaeological material, heritage identification, and the investigation of archaeological sites on the island in the future. This supports the possibility of providing valuable information about the archaeological context of a region on a minimal budget.

Figure 1. Iron-Age Cemetery and ruins of Näs Castle

Methods

Phosphate levels, in particular, degrade very slowly in natural conditions and therefore can be used for the qualitative analysis with few supplies. The Eidt method analyzes phosphate levels accumulation as a result of long-term human occupation. Organophosphate esters are a byproduct of bone decomposition, manure, trash pits, and architectural structures, which quickly convert into inorganic phosphate bonded in an inorganic manner to various metals (calcium, iron, and aluminum) in the soil (Eidt 1977).

Being a larger area, limitations were applied to where soil chemistry analysis was conducted on Vättern. Soil samples were collected from probable locations based on place-name, historical documentation, or likely settlement location. A UTM-coordinate grid system was applied to the map of the island, permitting a systematic approach to be taken for soil sample collection. Using a team of individuals, a leader directed the samples to be taken from the center of each UTM 50 meter square using handheld GPS devices. Each team member used a 30cm long metal auger device to collect 10cm soil increments down to the sterile layer, which was usually between 60cm and 90cm. Breaking the samples into 30cm sections allowed for the data to be analyzed both horizontally and vertically, creating a better understanding of which cultural layer had the highest phosphate levels. However, this method is not without its limitations, a low pH and naturally high levels of phosphate can skew results (Eidt 1977). The soil of Scania maintains low natural phosphate levels between 50 and 200 parts per million (ppm), which can increase 50-100 times the original levels at Iron Age sites (Callmer 1988). Being an agricultural community, plowing is frequently conducted on the island, which could be another implication. Fortunately, academic research has found that frequent plowing only decreases the phosphate levels by 10% over 2000 years (Eidt 1984).

Figure 2. Iron-Age Cemetery and ruins of Näs Castle

Results

The results found on the north end of the island were quite spectacular. Since the locations where phosphate constellations were found are simple coves and pasture head fields, they were largely unaffected. However, the phosphate levels there indicated that there was more than what they could see. The darkest blue squares correspond to the spot tests ranked as 3, or the highest phosphate levels. Achieving such high concentrations suggests that at one time within these UTM squares, there was a long duration of some sort of settlement. Many of the highest phosphate levels are surrounded by much lighter squares, which could mean that these residences of the past were not more than 50 meters wide.

The results from south-central Vättern did not reveal as many high concentration phosphate levels. However, the results that were found could be quite archaeologically significant. According to historical documentation, Strjø, Husaby and Valby was an area located around what are now the ruins of the Brage Castle (Jansson 2003). The results from this area are outlined below:

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References

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