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Something rotten in Scandinavia: The world's earliest evidence of fermentation

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ABSTRACT

Large-scale food storage has been identified at an Early Mesolithic settlement on the east coast of Sweden, implying a delayed-return subsistence strategy. The excavation and analysis of the contents of a 9200-year-old construction, combined with ethnographic analogies and modern knowledge of microbial activity, suggest that fish was fermented at the site. The identification of a foraging economy fermenting substantial amounts of fish, and conserving it for later use, thousands of years prior to farming and urbanized communities and without the use of salt, has implications for how we perceive the Early Mesolithic, suggesting semi-sedentism, technological skill and the ability to adapt rapidly to changing environmental conditions. Evidence of a delayed-return practice in Early Mesolithic foraging contexts raises questions regarding the current models used to estimate demographic parameters, such as population density and birth rate, for that time period, as well as indicating the existence of a more complex society than previously realized.

1. Introduction

Mesolithic research has focused on many aspects of society, from stone technology to mobility patterns and hunting practice. However, even though diet and subsistence strategies are common research topics, the actual food preparation and cooking processes have not been examined in the same detail (Milner, 2009). If it is assumed that only limited options were available during the Mesolithic, and any processing carried out was simply to make the food edible or taste better, this lack of research may be acceptable. However, if the aim of the food preparation was to enable long-term storage, further research is warranted: more complex planning and a delayed-return strategy are commonly used as criteria for identifying complex societies and an increasing degree of sedentism (Rowley-Conwy, 1983; Cunningham, 2011).

It is known from ethnographic studies of modern and historical foraging societies that the processes of smoking and drying food products are used to facilitate food preservation and storage (Ingold, 1983), providing analogies for the possible preservation of food products during both the Paleolithic and Mesolithic (Milner, 2009). However, these techniques are relatively simple and are often interpreted as indicating the use of small-scale, short-term storage practices by prehistoric foragers (Cunningham, 2011). Furthermore, these preservation techniques are time consuming, because the meat needs to be cut into appropriately sized pieces and hung on supports; even though large amounts of meat can be preserved in this way, it is a labor-intensive process (Stopp, 2002). Therefore, in circumpolar ethnographic societies relying heavily on fish for sustenance (e.g. the Kamchadals in Kamchatka), short fishing seasons with large catches prohibit the drying and smoking of all the fish needed for the winter, so most of the fish is instead conserved through fermentation, which is done in stone and earth-covered holes in the ground (Jochelson, Unpublished typescript of MS). The weather is also important regarding the choice of preservation technique: in some regions the climate can be too damp to dry fish and meat, hence fermentation is often practiced (Eidlitz, 1969).

Indirect evidence of large-scale storage in early foraging communities is provided with the presence of devices and traps that were used to capture large numbers of animals (Rowley-Conwy and Zvelebil, 1989). However, the lack of any direct evidence in the Mesolithic has led to delayed-return strategies being associated exclusively with Neolithic farming communities, where pottery, granaries and silos for large-scale cereal storage can easily be recognized (Cunningham, 2011). The lack of evidence of long-term and large-scale storage has been seen as evidence of mobile and less complex societies, the implication being that longer term storage equates with higher social complexity (Cunningham, 2011).

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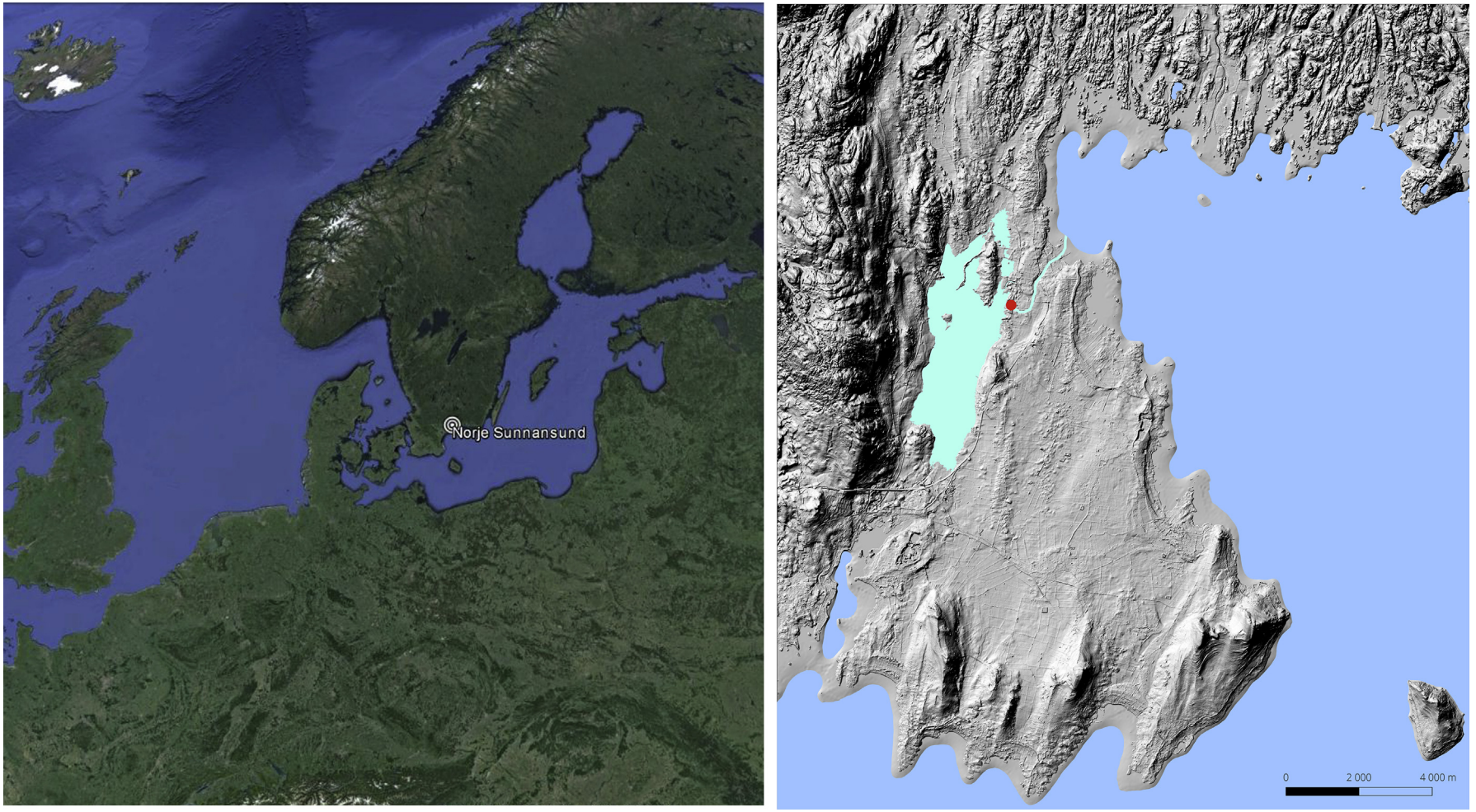

Fig. 1. The location of Norje Sunnansund (left) and the surrounding area around 9200 cal. BP (right). The map on the right is based on a terrain model at a 5-m resolution and on LIDAR data and topographic information from the Swedish Land Survey [© Lantmäteriet i2012/892], Swedish Geological Survey and Iowtopo2 (Seifert et al., 2001). Map by Nils-Olof Svensson, Kristianstad University. Picture on the left from Google Earth.