Scandinavian Cave Archaeology

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Abstract: Since the second half of the nineteenth century Scandinavian caves have been studied from various angles, to answer questions about their location, dating, and use. There was intensive archaeological interest in caves in the nineteenth century and at the start of the twentieth century. This has continued without interruption in Norway. There has been much less archaeological research on caves in Sweden, with nothing like the breadth and depth of its counterpart in Norway. However, in the last few decades archaeological cave research has seen a renaissance in both Norway and Sweden. This has been integrated not only in studies of landscape archaeology but also on other topics concerning cultural history, such as their practical function and symbolic meaning. Here a study of the caves at Kullaberg in southernmost Sweden helps to put Scandinavian cave research into perspective.

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Introduction

Countless caves along the Scandinavian mountain range were formed at different times and by various geological processes, probably during the Quaternary Period. The local crystalline bedrock is dominated by mica schist, gneiss or granite, but the mountain range also contains outcrops of weathered metamorphic limestone (marble) that contain long inland systems of karst caves (e.g. Faulkner, 2001). These were probably formed by the chemical and mechanical enlargement of fractures by flowing water during deglaciation events and during interglacials (Faulkner 2010). Some karst caves near the Norwegian coast contain palaeontological deposits (Faulkner and Hunt, 2009). There are also many marine caves formed in non-carbonate rocks (e.g. Sjöberg 1988), some containing deposits dating from Weichselian interstadials and the Holocene (e.g. Larsen *et al*., 1987; Larsen and Mangerud, 1989; Valen *et al*., 1996).

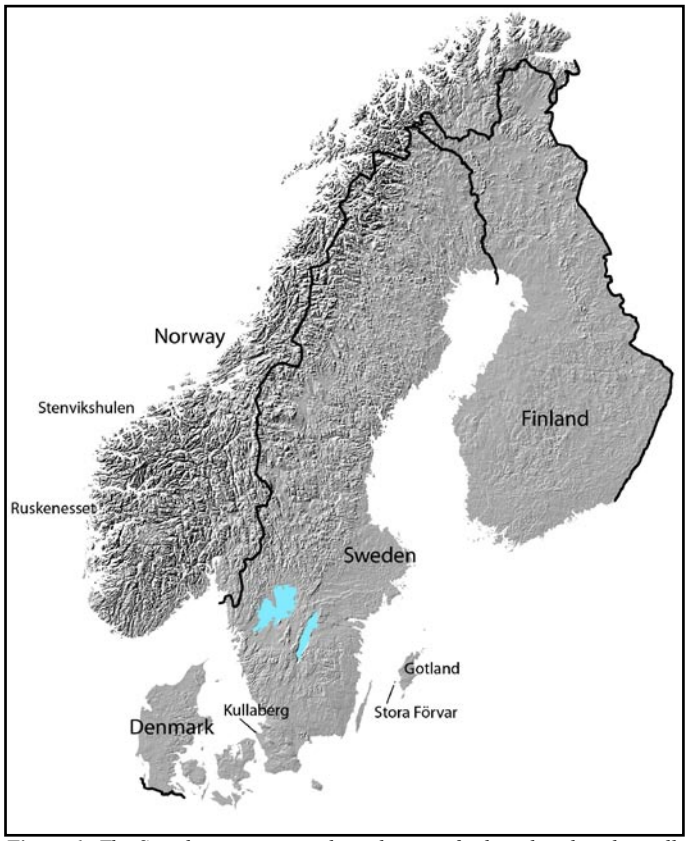

Figure 1: *The Scandinavian peninsula with sites of selected archaeologically investigated caves discussed in the text (Henrik Pihl, Riksantikvarieämbetet).*

Only relatively few Scandinavian caves have been investigated archaeologically. Since the middle of the nineteenth century caves and rock shelters with features such as rock paintings, graves and remains of settlement have been investigated along the west coast of Norway. The Swedish side of the mountain range has fewer known cave sites. Only a few of these have been examined archaeologically, chiefly on the west coast, at Kullaberg, northwest Skåne in southernmost Sweden, and on the Baltic island of Stora Karlsö, west of Gotland. There has been much more archaeological cave research in Norway than in Sweden.

The aim of this article is to highlight the archaeological research carried out in Scandinavian caves (Fig.1). A case study of the caves at Kullaberg will add new perspectives to a field of research that lies between the humanities and the natural sciences.

Archaeological Cave Research

Since the second half of the nineteenth century, caves have been studied by archaeologists for various reasons, to answer questions about their location, dating, and use. There was more intensive archaeological research interest in caves in the nineteenth century and at the start of the twentieth century. This has continued without interruption in Norway. Because caves are often in marginal locations in relation to farms and villages, they have not been among the main topics of archaeological research in Sweden. In the 1940s, however, even in Norway archaeological research on caves and rock shelters was neglected because of an increased interest in Iron Age farm settlements (Bergsvik, 2005, p.240). In the last few decades, archaeological cave studies have seen a renaissance in both Norway and Sweden.

The renewed research interest is associated with new theoretical perspectives in archaeology. An awareness that it is possible, with the aid of archaeology, to study cultural phenomena over long periods has meant that cave research has been integrated not only into studies of landscape archaeology but also into other topics in cultural history.

Norway

Scholarly and popular publications about Norwegian caves are numerous. Research projects have concerned individual caves and surveys of finds and research problems (Brøgger, 1910; Nummedal, 1913; Odner, 1973; Hjørungdal, 1991; Prescott, 2000; Bergsvik, 2005). Classical sites such as Stenvikshulen (Figs 1 and 2) and Ruskenesset (Fig.1) in Vestlandet were early discoveries (Bendixen, 1870; Brinkmann and Shetelig, 1920). Since then they have been a part of the archaeological discourse. In several caves and rock shelters, traces have been found from all prehistoric periods, from the Mesolithic to the present day.

On the west coast of Norway, the discovery of Iron Age settlement in caves opened a broad culture-historical discussion. The caves on the Norwegian west coast were used in connection with the hunting of wild reindeer, iron extraction and the production of whale oil (also known as train oil), and also as temporary shelters or more permanent dwellings (Hjørungdal, 1991).

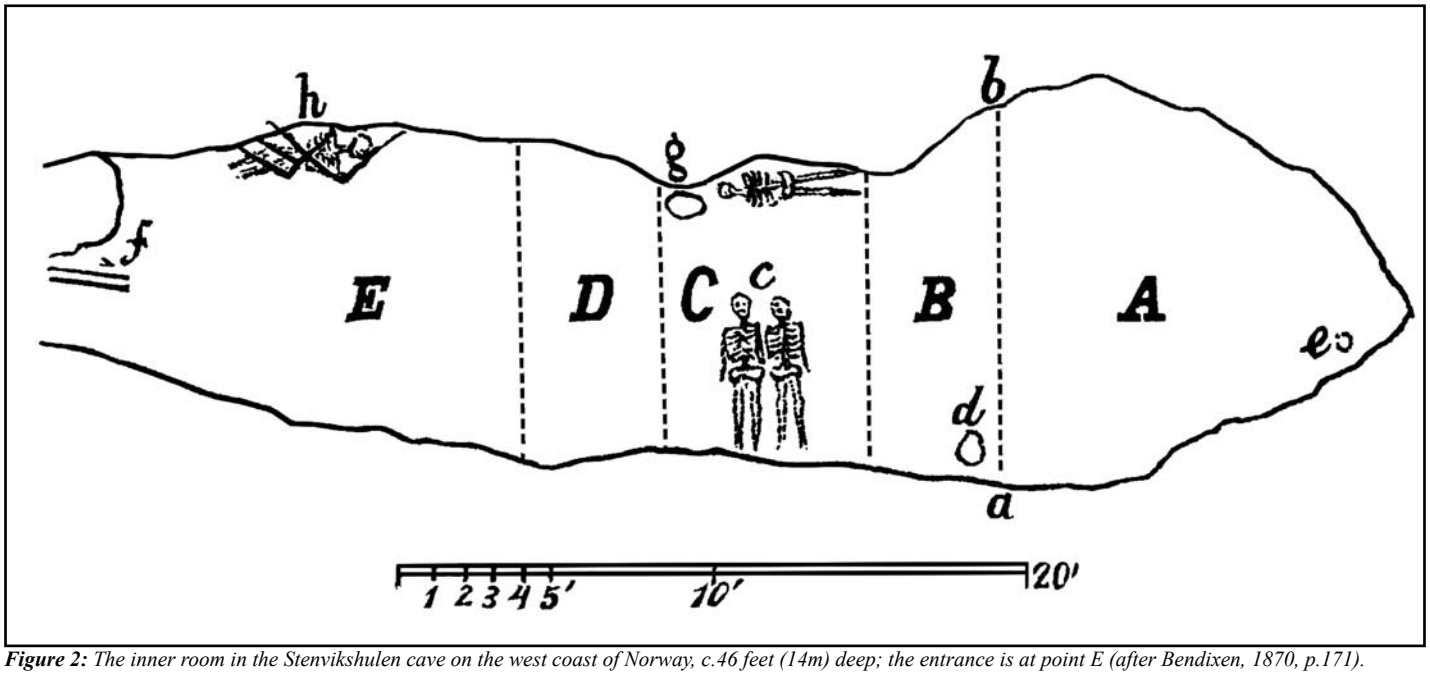

Figure 2: *The inner room in the Stenvikshulen cave on the west coast of Norway, c.46 feet (14m) deep; the entrance is at point E (after Bendixen, 1870, p.171).*

Cave and rock shelter surveys show that the chosen cave locations were near the coasts, in the fjords between the coast and inland, and up in the mountains. The caves were integrated with the agrarian settlements and have therefore been interpreted as the farmers' use of outland resources (Hagen, 1967, pp.180ff.; Bakka, 1973; Jansen, 1973).

Anthropological theories have inspired interpretations of the rock shelters in terms of a maximized utilization of resources in connection with fishing and hunting. Moreover, caves and rock shelters have been regarded in socio-economic terms as being part of a larger redistributive system. In their ecological marine niches they were places in a larger exchange system, in which they supplied food from fishing, sailing and fowling within existing chiefdoms. The chief organized the catch and the subsequent exchange between hunters, fishermen and farmers (Odner, 1973, p.156).

After the 1990s, less attention was paid to economic and ecological models, and archaeological research was instead concentrated on the experience of the sites and their symbolic meaning. The skeletal material in the caves was related to the Norse world-view according to which humans could end up in different abodes after death (Bergsvik, 2005, p.252). Iron production and slag were also interpreted in a ritual context, linked to Norse mythology; the Norse smith enjoyed a special status, associated with dwarfs, with magic, mountains, and the underworld (Barndon, 2005).

Sweden

Swedish archaeological cave research is on a much smaller scale and has nothing like the breadth and depth of its Norwegian counterpart. Caves have not occasioned any major archaeological research efforts. Swedish studies have chiefly been concerned with two areas: the Baltic island of Stora Karlsö near Gotland, and the Kullaberg peninsula in southernmost Sweden (Fig.1).

One of the first caves to be investigated archaeologically in Sweden was Stora Förvar on Stora Karlsö in 1888 (Fig.3). The cave turned out to contain remains from the Palaeolithic and Neolithic. Most archaeological culture groups are represented. Sporadic visits could also be observed to have taken place as late as the Iron Age (Schnittger and Rydh, 1940; Lindqvist and Possnert, 1999). With a broader landscape-archaeological perspective on Iron Age settlements on the island, smaller caves were investigated in 2009 (Cassel and Nilsson, 2010).

The excavations of the caves on Kullaberg were inspired by the European investigations of Palaeolithic caves and the excavation of the Stora Förvar cave on Stora Karlsö. Gustav Retzius and Hans Wallengren investigated the caves on Kullaberg in 1902 (Retzius and Wallengren, 1903). The excavation method – dividing the caves into smaller find units, documented in plan and section – followed the methods used in Stora Förvar. The archaeologist Bengt Salomonsson continued with these methods when he started excavations in 1950. Inspired by the phenomenon of caves as a whole and the fact that the caves on Kullaberg are a part of the archaeological discourse, a study of them was again conducted at the start of the 2000s (Jennbert, 2009, 2011). The investigation of the Kullaberg caves functions in this context as a case study of archaeological cave research in Scandinavia and the problems of interpreting earlier records of excavations, finds and their contexts.

The caves on Kullaberg

There are more than twenty caves around the Kullaberg peninsula (Fig.4). They are of a completely different character from the large, deep European caves utilized since the Palaeolithic or the deep karst caves on the west coast of Norway. The Kullaberg caves are sea caves, more shallow and open. Most of them are *abris*, half-caves giving shelter from the weather.

Currently these caves lie some distance from the water's edge, up to 12m above sea level. The highest marine limit augmented by the melting of the ice sheet gave sea water the opportunity to hollow out the

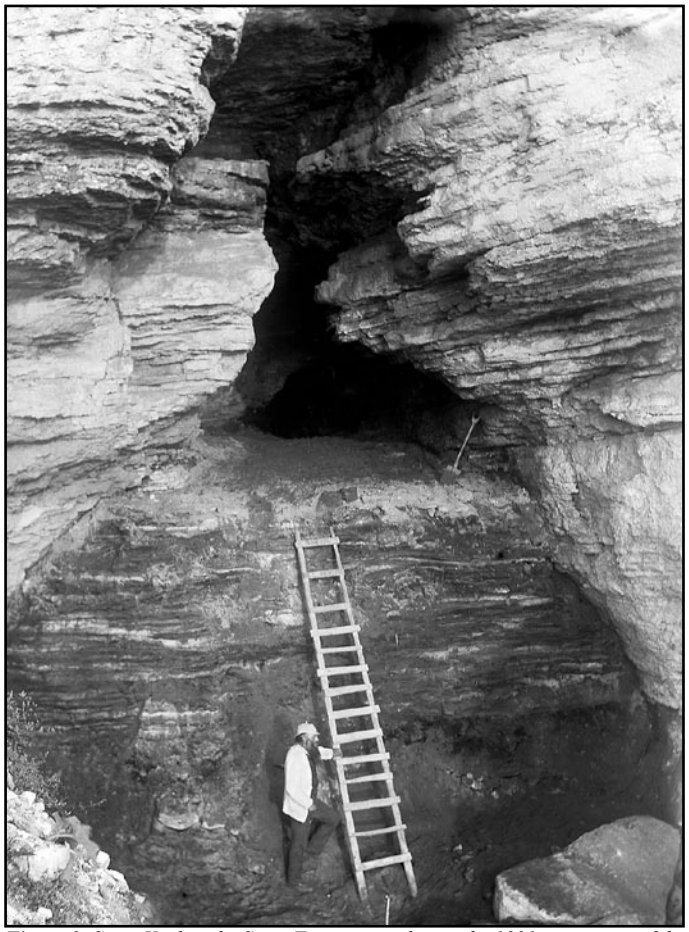

Figure 3: *Stora Karlsö, the Stora Förvar cave during the 1891 excavation of the Neolithic dwelling site (Photo: Hjalmar Stolpe,1891).*

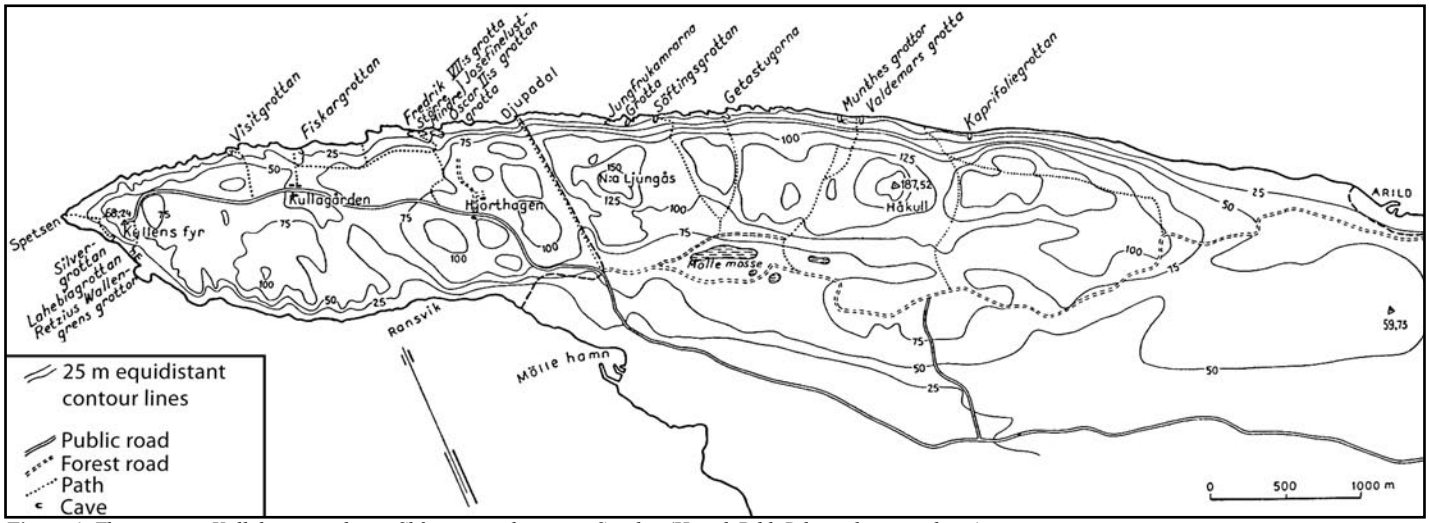

Figure 4: *The caves on Kullaberg, northwest Skåne in southernmost Sweden (Henrik Pihl, Riksantikvarieämbetet).*

rock, and the caves were formed by several geological processes. Sea breakers assisted by frost weathering caused weaker parts of the rock to break off. Less resistant types of rock were eroded preferentially. Loosened stones acted as grindstones, hollowing out the rock (e.g. Sjöberg, 1981). Gradually the stones were rounded into pebbles, now extending as shingle beaches and lying at the bottom of deep ravines.

The effects of frost led to more fracturing of rock, such that loose pieces could fall from roofs and walls. Moisture in the sea caves would freeze in cracks in the rock during the cold season, leading to the breaking off of more rock fragments. Cave roofs gradually became higher, and floors sank as the bedrock and fallen debris were eroded by the waves.

Whereas the caves on Kullaberg were formed in this way, their appearance has changed since they emerged above the tidal range. In the long term, they risk disappearing because of the on-going effects of disintegration by natural forces (Behrens, 1953).

When people used some of the caves on Kullaberg, occupation layers were mixed with weathered material falling from the roof and walls. Frost-cracking helped to fill some of the caves with fallen rubble, and the archaeological finds are within layers mixed with gravel and stones from disintegrating roofs and walls. The archaeological finds therefore did not lie in undisturbed occupation layers, but might have been moved by natural forces, as well as by wild animals and new generations of people who visited the caves.

Only a few of the caves on Kullaberg have been investigated archaeologically. Clues about what people did in the caves and how Kullaberg might have been used over the millennia are provided by the archaeological finds. When combined with considerations of faunal history, changes in the shoreline, and radiocarbon dates such archaeological evidence allows inferences to be drawn about when the caves were used. It appears that people have used the caves from Palaeolithic times right through to the present day.

Topography

Modern calculations of shoreline changes at Kullaberg show that the sea level has undergone radical changes since deglaciation. Kullaberg was the first visible land in southern Scandinavia following the last glacial maximum. When the ice sheet receded 17,000 years ago, the highest marine limit was some 88–89m above present sea level (Sandgren and Snowball, 2001). With land uplift there was a relative fall of sea level and in some favourable locations caves were formed, especially as their locations passed through the tidal range (Faulkner, 2005).

When the ice sheet relaxed its grip on Denmark and the Kattegatt was formed, Kullaberg was an arctic island surrounded by sea water. Changes in the shoreline during the postglacial period exposed the rock. Most of Kullaberg's caves occur on or near accumulations of shingle, which are commonly at the bottom of deep ravines or in small bays. The presence of several embryonic caves suggests that caves could have been formed anywhere in the coastal zone where the bedrock was sufficiently soft to be hollowed out. Cave formation was not associated with any particular topographical level but occurred at different elevations as sea levels changed after Kullaberg became free of ice. Most, but not all, of the caves were formed during the Litorina period (7500 – 4000 years ago), when the sea was between 5 and 10m above the present sea level (Behrens, 1953, p.63).

Generally speaking, caves located at today's 5-metre level might have been used from the Palaeolithic through to the Late Mesolithic/ Early Neolithic, the Iron Age, and modern times. Caves located between 5 and 10m above sea level were accessible in the Late Glacial period, the Bronze Age, the Iron Age, and into modern times. The few caves located above the 10-metre level could have been used throughout prehistoric times, except during the part of the Late Glacial period when the water was at its highest. It is important to note that the shoreline displacement is not linear in this part of the Kattegatt as shown in Table 1. Therefore there has been only intermittent access to the caves during the Holocene.

^{14}C years BP	Metres above (+) or below (-) present sea level
14 000	+85.0
10 500	- 10.0
10 000	- 20.0
8 000	- 5.0
6 200	+ 10.0
4 500	+ 8.0
2 800	+ 5.0
2 000	+ 2.5
1 200	+ 1.0

Table 1: *Shoreline displacement in the Kullen area (Berglund, in manuscript).*

Archaeological investigations

Almost at the outer tip of the Kullaberg peninsula, on the south side, is the Lahibia cave. It is located between two cliff faces (Fig.5). The cave is fully visible from the sea and is easy to reach by boat. To reach it from land one has to walk down a steep ravine or climb along the rock to get into the crevice. Except when the wind is from due west, the cave is sheltered, about 80m in from the water's edge. Today it is over 7m above sea level, but it was filled with water during much of the Mesolithic (Table 1).

The cave is formed in gneiss and is highly tectonized; there is micaceous rock in one narrow section (Behrens, 1953, p.59). It is rather large, running almost 10m into the rock, from an opening that is roughly 6m wide and 4m high. Because there is heavy weathering on Kullaberg it is clear that the cave dimensions have changed over the millennia. Before the archaeological investigations the semi-circular floor inside the cave was filled with falls of weathered rock, in places to a depth of almost half a metre above the archaeological sediments. The cave was examined on two occasions (1902 and 1956), and the archaeologists have written about the laborious work of clearing the floor of fallen stones and blocks (Jennbert, 2009, p.37).

The layers in the Lahibia cave rested on a continuous smoothly-polished rock foundation. At the mouth of the cave the sequence of layers was almost 2m thick, but it was much thinner inside the cave. The stratigraphy consisted of several different layers, and despite being excavated stratigraphically, the content and boundaries of these layers did not become clear until the end of the excavation. Occupation layers were mixed with stone and weathered gravel from the cave itself.

As well as the weathered material, the layers consisted of charcoal and ashes from hearths, plant remains, bones, molluscs, and food remains from meals in the cave (Fig.6) Relatively few artefacts were retrieved from the different layers. Flint, pottery, and iron nails and rivets are the most characteristic objects (Jennbert, 2009, pp.39ff.).

The bulk of the finds in the Lahibia cave are animal bones that were mainly deposited in the cave as a result of human activity and to a lesser extent through nature's own processes – that is, by the wind, by water, or by animals. Deposits in the Lahibia cave were found to contain 79 species of vertebrates (19 mammals, 33 birds, 2 amphibians, and 25 fish) together with 11 species of invertebrates (9 molluscs and 2 crustaceans). Domestic animals – cattle, goats, sheep, and pigs – are the most common mammal remains. There are smaller numbers of game animals, both from the sea and from the forest: seals, porpoises, and possibly red deer. Fish bones dominate the assemblage, with cod and herring as the species most commonly identified. Bird remains are rare by comparison (Table 2).

The bone material is unique by virtue of its location in the northern Öresund and southern Kattegatt. Thanks to the large number of species and the thorough analysis undertaken by Johannes Lepiksaar (one of the founders of European archaeozoology) the animal bones provide a significant contribution to the current knowledge of southern Scandinavian faunal history, for example because of the recognition of the harp seal and the extinct great auk.

Lepiksaar (*in* Jennbert, 2009, pp.157–223) describes the bones as being a result of people dragging animals into the cave or bringing them in when visiting the cave. They could have been catches from fishing, quarry from hunting or the remains of meals. The evidence provided by the animal bones makes it possible to put the Lahibia cave into its broader culture-historical context.

Considerations of the archaeological and osteological finds, the radiocarbon dates, and the location of the cave in the terrain indicate that the use of the Lahibia cave can mainly be placed in the Late Iron Age (the seventh–eighth centuries AD), the Middle Ages (AD 1050–1536) and the seventeenth century. There are also indications of usage in the Palaeolithic, but the age of these deposits cannot be refined further.

Archaeological excavations and subsequent evaluation of the finds and the circumstances surrounding them show that the layers in the Lahibia cave have presumably been affected by the weathering of the cave itself and by animals that have used the cave. Archaeological finds are very sparse, and the sequence of layers is difficult to interpret using the previous excavation plans and reports. Despite many such problems in the interpretation of the stratigraphy, there are several observations which, regardless of the stratigraphical uncertainty, make the finds interesting from a scholarly point of view. Based on the finds and the circumstances, the activities described below might have taken place in the cave.

The *first activity* is flint knapping. People in the cave or in its vicinity worked flint. There are no natural occurrences of flint on Kullaberg. Beach flint might have been gathered, but the flint found in the Lahibia cave must have been brought there by people. Finds of hammerstones, blocks, flint flakes, and occasional blade fragments indicate that people knapped flint at the mouth of the cave. Some of the flint is burnt, which suggests that there was a hearth at the cave and that some pieces of flint ended up in the fire. The fact that there are no finished flint tools might indicate that people took these with them when they left the site.

Figure 5: *The Lahibia cave on Kullaberg (Photo: Kristina Jennbert, 2008).*

Layer	Number of Identified Specimens and [weight in grams]									
	Mollusca		Pisces		Aves		Mammalia		Sum	
I	832	[2335.0]	193	[158.0]	68	[4.0]	530	[317.0]	1629	[2814]
%	51	[82.9]	12	[6.0]	4	[0.1]	33	[11.0]	100	
II	81	[279.0]	1855	[273.0]	93	[5.0]	789	[25.0]	2818	[782]
%	3	[35.0]	66	[35.0]	3	[1.0]	28	[29.0]	100	
III	39	[25.0]	1021	[144.0]	18	[5.0]	172	[120.0]	1250	[294]
%	3	[8.0]	81	[49.0]	2	[2.0]	14	[41.0]	100	
IV	3		214		50		158		425	
%	1		50		12		37		100	
IV+V	11	[2.0]	446	[316.0]	54	[10.0]	117	[197.0]	628	[525]
%	2	[0.5]	71	[60.0]	8	[2.0]	19	[3705.0]	100	
V	2	[337.0]	505	[117.0]	26	[5.0]	354	[106.0]	887	[565]
%	0.2	[60.0]	56.8	[20.5]	3	[1.0]	40	[18.5]	100	
VI	84		900		92		1031		2107	
%	4		43		4		49		100	

Table 2: *NISP (Number of Identified Specimens) and weight in grams, and associated percentages, of each Order in layers I-VI in Lahibia cave (Lepiksaar in Jennbert, 2009, p.162).*

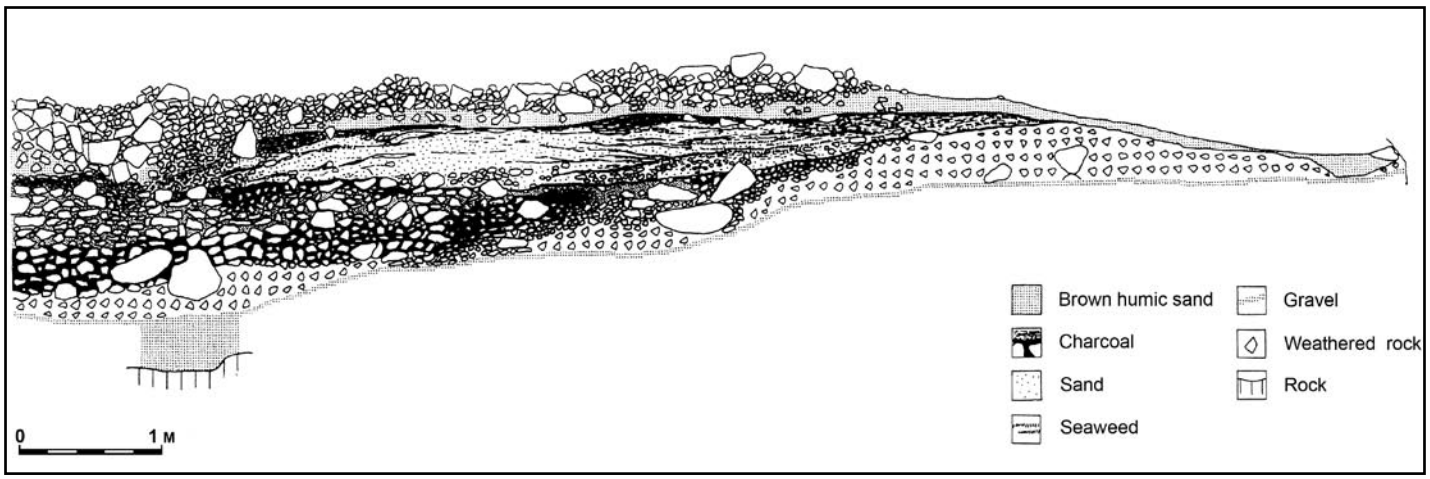

Figure 6: *The stratigraphy of the Lahibia cave. The cave entrance is at the left end of the section.*

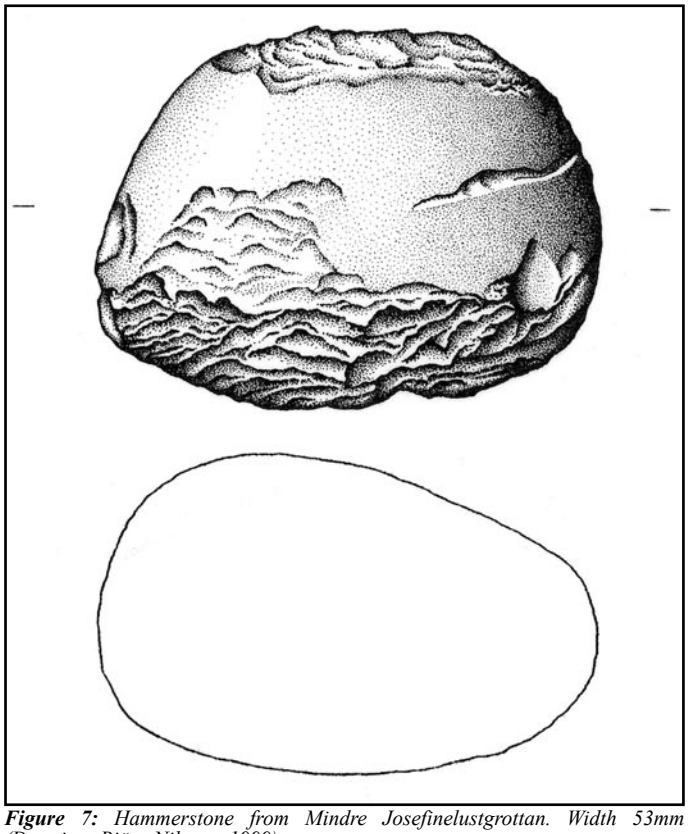

Figure 7: *Hammerstone from Mindre Josefinelustgrottan. Width 53mm (Drawing: Björn Nilsson, 1999).*

Unfortunately, the retrieved flint objects cannot be dated any more precisely than to the Palaeolithic. The dating of the flint knapping rests on the position of the objects above sea level and in relation to the changes in shoreline in the Kullaberg area. The finds could derive from a visit to the site in the Palaeolithic, that is, before the Litorina period when the amount of water increased and the shoreline was above the cave.

A *second activity* which stands out clearly among the finds is fishing. The majority of the bones in the Lahibia cave are from fish. The number of bones in the Lahibia cave suggests that the catch was not transported away whole; people cleaned and filleted the fish and also consumed some of the catch on the site.

The complex sequence of layers in the Lahibia cave is interpreted by Lepiksaar (Lepiksaar *in* Jennbert, 2009) as being based on differences that arose as a result of variation in the intensity of fishing, the methods used, and the seasonal distribution over the year at different phases in the history of the cave. Lepiksaar's concrete interpretation of the stratigraphy (Fig.6) not only gave him an analytical tool, it also provided an analytical entrance to the entire interpretation of how the cave was used. The traces of fishing in the Lahibia cave are mainly dated to the Late Iron Age. The fishing was probably of a more household character and not of the large dimension displayed by the medieval herring fishery, when it was under royal power (Ersgård, 1988; MacKenzie *et al*., 2002).

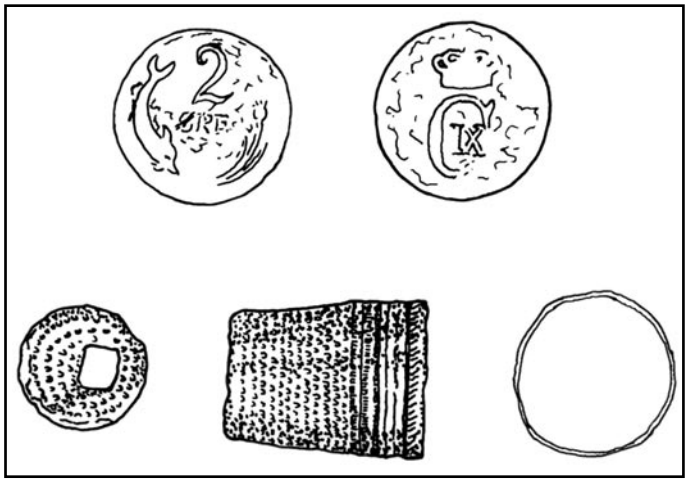

Figure 8: *Finds from the tourist era around 1900. Coin diameter 21mm, thimble lower rim 19mm (Drawing: Viveka Rönn, 1998).*

There is no evidence of any permanent habitation in the cave or animal husbandry beside it. Therefore fishing seems like a much more probable reason for the use of the cave than any possible association with grazing on the mountain.

There is no further detail on the excavated plant remains, making interpretation difficult. One possible interpretation is that they were of marine plants, from the cleaning of fishing nets, which caused seaweed from many seasons of fishing to end up in the stratigraphy. Another possibility is that they were land plants and might have been brought to the cave by people, to be used as bedding. Without relocating and analysing the material this aspect of the site cannot be examined further.

People stayed in the cave in connection with fishing. They also cooked food in or near it. There is charcoal scattered throughout the cave, and it may be assumed that there were probably one or more hearths in the cave even though no sooty, fire-cracked stones were found in the excavated area. Burnt material is scarce.

The availability of the different animal species, the migration and breeding of birds, and the annual migrations of fish, in combination with an analysis of wind conditions at Kullaberg, suggests that the Lahibia cave was used seasonally. Deposits attributed to spring months (March, April, May) are common, but those from autumn months (September, October, and early November) predominate. In general the autumn months were the main period for the use of the Lahibia cave, and it is likely that people were only there for short periods.

To sum up, the Lahibia cave was mostly used during short periods in the spring and autumn for fishing. Meat and fish were cooked here, and the food was consumed on the site. Meat was brought down to the cave and the fish was brought direct from the sea. This took place in the Iron Age (presumably in the seventh and the eighth centuries AD), in the Middle Ages, and possibly also in connection with the rock quarrying that took place in the neighbouring bay in the 1560s.

Two other archaeologically investigated caves may be mentioned briefly: Mindre Josefinelustgrottan and the Fredrik VII cave are located on the north side of Kullaberg. They were formed in a kullaite (a variety of microgabbro) dyke (Behrens, 1953, p.60).

In Mindre Josefinelustgrottan it was possible to discern a fairly clear stratigraphy, but unfortunately there were few finds. The cave was excavated 1957 by the same archaeologist, Bengt Salomonsson, that excavated the Lahibia cave. Technically it was a complicated excavation with a small area in which to work, and lighting conditions became very poor as they moved further into the cave.

Outside the cave, flint was scattered over the whole of the outer excavated area, and pieces were found in virtually every layer. In the section farthest out from the cave, just before the precipice, however, there are very few finds. There could possibly have been a hearth outside the mouth of the cave, judging by scattered pieces of charcoal, some sooty stones in a deeper layer, and the slightly shaly character of the adjacent rock. The finds inside the cave are of the same character as the finds outside. They are concentrated in the middle of the cave, with the fewest occurring in the innermost part and in the square nearest to the mouth.

A large share of the finds consists of relatively small flint flakes, blades, blade fragments, and microblades, and a hammerstone (Fig.7). Only a tiny proportion of the flint was burnt; the majority showed no signs of burning. A few tools, such as a transverse arrowhead, a stump-butted axe, and blade scrapers testify to the use of the cave by humans during the Mesolithic, both as a knapping site and as a station for hunting or preparing food or tools.

Inside the cave there were a great many stones of various rock types. The archaeological layers seem to have been mixed with rock falls from the roof and walls. Another category is pebbles, which were found in most layers. They are presumably remains of the time when the cave was formed and a shingle beach was present at the opening to the cave.

Some people in modern times have lost personal belongings when visiting the cave. Several finds testify to these visits: a thimble, a button and a bronze bead, and a little piece of bronze foil. A two-öre coin from the reign of Christian IX (King of Denmark, 1863–1906) is another find from the modern era (Fig.8).

The osteological material from Mindre Josefinelustgrottan gives another hint as to how the cave might have been used. The wealth of animal species that were seen in the Lahibia cave is absent in Mindre Josefinelustgrottan. Apart from a passerine, possibly a robin (*Erithacus rubecula*), there were bones from a sheep (a young animal) and two goats (one young and one adult animal) (Jennbert, 2009).

Limitations and dating

Archaeological and geological study of the caves shows that they were used over a very long time – much longer than just the Mesolithic, the period when they are often assumed to have been used. It is a complicated research process, however, to draw conclusions about dating from archaeological and osteological material and to interpret the finds and their context. The artefacts are few in number and they tell us little.

The fragments that survive today have undergone many taphonomic processes. The physical and chemical processes in the ground have affected preservation conditions, determining what survives today, and excavation techniques affected what has been retrieved. Having grown up in the middle of the twentieth century with modern western cultural norms, my own perspective influences my interpretation of bygone times and of what might have happened in and near the caves on Kullaberg far back in time.

Archaeologists are forced to work with questions of representativeness and must assess critically the fragments that can be studied. Taphonomic processes, the decomposition of material that takes place with the passing of time, have considerably reduced the original material remains in the caves. Rock falls and natural erosion of the rock inside the caves have disturbed the sequence of layers. Moreover, the archaeological investigations covered small areas in the caves, and most of the caves have not been excavated at all. Bearing these limitations in mind, the archaeological and osteological finds from the caves have to serve as a foundation, representing the activities that took place in them.

Archaeological finds in the investigated caves are few in number and fragmentary. They nevertheless give hints about the dating of occupation layers. The finds and the radiocarbon datings of charcoal and animal bones give some fixed points for dating and an estimate of the periods when the caves were most intensively used. These can be summarized as follows: The Lahibia cave is located at such as low level that it must have been filled with water for most of the Mesolithic. Finds of flint, however, make it possible to date activities at the cave to the Palaeolithic. People may have been near the cave during the Palaeolithic, and objects from that time were later incorporated in the different layers in the Lahibia cave. On the other hand, iron nails, radiocarbon-dated animal bones, and late red earthenware in the Lahibia cave date the use of the cave to the Late Iron Age and the Middle Ages. The stone finds in Mindre Josefinelustgrottan and radiocarbon datings of bones of sheep/goat indicate visits here at different times: the end of the Neolithic, the Roman Iron Age, the seventeenth century, and modern times.

Interpreting the use of the caves

What happened down by the Kullaberg caves? What did people do there? Clues from the archaeological investigations, from events in local history and in broader political contexts, suggest several answers.

The caves face the sea, and since they are sea caves, formed by the movements of the waves, they belong to the maritime landscape. There is ambiguity in the way the caves have been regarded. Whether you approach them via land or from the sea you are affected by this ambivalence as to where they belong, between land and sea.

Geological factors, such as changes in shoreline, erosion by wind and water, and the strength of the rock itself, provide basic knowledge. This dependence on nature, this slowly changing history, *la longue durée*, constitutes the foundation for interpretations of the use of the caves. The archaeological analyses and osteological identifications, together with Johannes Lepiksaar's expert analyses of the fishery and the stratigraphy of the caves, provide other basic knowledge. A kind of history of events can be glimpsed, as occasional visits to the caves in different periods become more visible in pace with the faster rate of change in social and political life. The two temporal perspectives, inspired by the French *Annales* School and Fernand Braudel's studies in the history of mentalities (Braudel, 1980), together constitute a theoretical starting point for the interpretation of the caves.

One of the methods for extending our knowledge of the role of the caves in the landscape is to test the terrain and topography for oneself. Using oneself as a method is a part of the work of interpretation. This method has been tried by many archaeologists and anthropologists. Becoming a part of one's research material gives insight into the objects one wishes to study (Tilley, 1994; Jennbert, 2000).

Climbing down to several of the caves has proved to be complicated; fitness, the weather, accompanying people, and what is being carried are all significant factors. A full storm, small children, and poorer physical fitness can increase understandings of which categories of people might have used the caves. Likewise, navigating in towards several of the caves from the sea is an experience, demonstrating that the weather and the direction of the wind are as significant as the type of boat, if one is to be able to land successfully. Access to the caves is limited, and it takes energy and strength to reach several of them.

The caves are constants over time, even though they have changed in shape and appearance as a result of erosion by wind and water. At the same time, their function is changeable, since the social and cultural reality has changed across the course of the millennia. Historical events, in the context of their time and situation, are significant for enabling us to interpret the caves, despite the fragmentary evidence, in terms of different activities or purposes. Most of them are connected with the marine environment, and with the utilization of natural resources: fishing, animal husbandry, and stone quarrying. A flow of tourists that started in the middle of the nineteenth century, stimulated by the desire of people to experience the natural scenery of Kullaberg, is another activity that affects the caves. The individual archaeological fragments only acquire a meaning in an interpreting situation, when they are associated with events and situations outside the caves.

This approach to the problem of interpretation belongs both to a long-standing archaeological tradition of culture-historical research and a more modern post-processual archaeological research tradition. The caves provide interdisciplinary knowledge but are also put in a broader historical and cultural context. In the course of the research assignment, the total history of the caves emerges, from their probable formation during de-glaciation to their use in the present. Despite their geological and topographical changes, the caves remain constant in their own history.

Current cave archaeology in Scandinavia

Research on the Kullaberg caves involves technical problems of excavation and aspects of archival research that are crucial for the dating and interpretation of the archaeological and osteological material. Research has proceeded from the potential of the long archaeological temporal perspective to study the cave phenomenon with theories and methods taken from different fields of scholarship.

A similar approach can be found in current archaeological cave research in Norway and Sweden. Generally speaking, it is characterized by the perspective of cultural history. Research is about analysing and narrating a history of caves, often with inspiration from the history of mentalities and always with an interdisciplinary approach. The methods and outlooks come from both the humanities and the natural sciences. Scandinavian archaeological research can be summed up in the following points:

1. Caves and rock shelters with human use in Scandinavia are interstadial and postglacial phenomena;
2. Interdisciplinary analysis. Theories and methods from the humanities, social sciences, and natural sciences;
3. Cultural history (folklore, local history, and political events);
4. The long-term perspective.

The archaeological research task, to make a synthesis of facts and evidence from a wide range of fields of knowledge, thus comprises several different academic disciplines. Analyses of objects and their contextual connections are of as much evidential value as scientific methods and findings about geological formations, cave development, changes in sea level, and identifications of bones.

Taken together, theories and methods from both the humanities and the natural sciences are a shared foundation for analysing cave environments. The scientific methodology and theories undoubtedly differ in the various disciplines. Each scholarly culture has its own research habitus, with the researcher concentrating on questions that fall within the framework of the subject's research traditions (Bourdieu, 1992). In the 1970s archaeology, especially the variety known as processual archaeology, became dependent on the natural sciences for its theory formation, and many major collaborative projects developed (Trigger, 1989). With post-processual archaeology, which emerged in the 1990s, other theoretical perspectives were formulated and there was less collaboration between archaeology and science subjects. Moreover, it became important for archaeology not only to pursue research on problems within the discipline, but also to emphasize the significance for contemporary history. Archaeologists also started scrutinizing their own times, and how the past is used in the present, with more distinct sources of inspiration from other subjects in the humanities and social sciences than before. Since the turn of the millennium, cooperation between workers in the humanities and the natural sciences has once again become relevant.

Current Scandinavian archaeological cave research bears the stamp of this interdisciplinary and multi-period approach. Norwegian cave research has been integrated in archaeological research in a more profound way than its Swedish counterpart, and it has followed trends in the history of scholarship during the nineteenth and twentieth centuries and into the present century. There are shared features in ongoing research in Norway and Sweden. Briefly, interpretations of the use and meaning of caves concern:

- Practical functions (seal hunting, fishing, flint knapping, bronze casting, iron smelting and forging, rituals, and burials);
- Gendered roles of hunters, farmers and craftsmen;
- Spiritual phenomena;
- Sacred places;
- Symbolic reservoirs;
- Social identity of the users.

Caves can function as constants in the long-term perspective. Those with archaeological significance have existed in the landscape since at least the Mesolithic. Research on caves therefore involves questions of practical activities and their cultural meaning in both past and present. Applying the perspective of the past, the emphasis today is on questions about caves in a liminal landscape, and caves acquire "meaning" by virtue of their peripheral placing and a form of otherness. With the present-day perspective, the caves become a symbolic reservoir for our need for natural landscape and recreation, not infrequently expressed in the stereotyped image of the caveman.

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