ЕСТЕСТВЕННЫЕ НАУКИ И АРХЕОЛОГИЯ

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Climate and history. Scandinavia and beyond

Рандсборг К. Резюме. Климат и история. Очерчены трудности измерения климатических изменений, а также выявления устойчивых отношений между этими изменениями и археологическими/историческими данными. В истории редка монокаузальность, а монокаузальные объяснения опасны. Тем не менее, можно говорить о том, что глобальное потепление в конце ледникового периода подстегнуло культурную эволюцию. В статье рассматриваются события и процессы, происходившие в Скандинавии и Арктике, для которых обычно предлагаются «исторические объяснения» без должного учета климатических факторов.

Ключевые слова: климат, история, послеледниковье, Скандинавия, Гренландия.

Abstract. Difficulties of measuring climatic change are outlined, along with problems of establishing firm relationships between archaeological/historical data and climatic change. Mono causality is rare in history, and dangerous to apply. However, the sudden Global warming at the close of the Ice Age did spur massive environmental and cultural evolution. Special attention in the paper is given to the evidence from Northern Europe/Denmark and the Arctic, where «historical explanations» are suggested rather than climatic/environmental degradation. Man's unique ability at adapting to change is emphasized.

Key words: climate, history, post-Glacial, Scandinavia, Greenland.

Spectrum

The relations between climatic change, historical event and social processes are not straightforward. At the one end of the spectrum we have broad correlations (often established across millennia) between climate, flora and fauna, and culture. Such correlations rarely reveal causality between factors. A specific question, such as the impact of climatic change, can rarely be answered except in very general terms. At the other end of the spectrum, we have historical events that are clearly influenced by climate, if not necessarily caused by it. An example is the march by the Swedish army across frozen Danish Belts in the unusually hard winter of 1658 (Randsborg 2009), leading to the loss of Eastern Denmark — today a part of Sweden. Nowadays the two parts are linked by the gigantic Øresund Bridge providing access to the stronger Danish economy for Swedish citizens working in Copenhagen. Even in cases where climate is established as a factor, the results centuries later are hard to predict.

Problems and observations

Trajectories of climatic change are difficult to establish for the archaeological past, including annual cycles important to the subsistence. To farmers in Scandinavia, cold winters are of less concern than cold summers; a certain measure of

dry weather even being beneficial, while it may be catastrophic in the Mediterranean. Furthermore, using pollen and other botanic evidence, it is often impossible to distinguish lower temperatures from increasing dampness: factors often related in a cool temperate climate such as the Scandinavian.

The meagre raised bogs of Denmark may well be beautiful archives on climatic development, since they are independent of the ground water and only grow from precipitation (Randsborg 1980). They reveal the existence of cyclic shifts between dry and wet periods, on the average at 260 years' intervals. Nevertheless, it is impossible to connect this evidence with the development of settlement and culture. Still, archaeologists lean their heads on scientific data and models in the hope of long sequences of climatic evidence.

Long sequences indeed, the Scandinavian bogs are true treasures of information and fine artefacts, for instance clothing and organic materials long gone in other climates, including completely preserved human beings (even their stomach contents can be read). Some of the most conspicuous finds from Denmark's past have been found in the bogs: Oversized polished flint axes and necklaces of thousands of amber beads from the Neolithic; Bronze Age paired *lur* trumpets and helmets, cultic calendar shields, gold rings and drinking cups, and other vessels; Iron Age parade wagons, golden horns, sacred vessels from across Europe, and full weaponries for armies running into the thousands, including magnificent boats, etc., etc. (Engelhardt 1865; Randsborg 1995; van der Sanden 1996; Jensen 2001; etc.). More Roman sword blades have been found in Jutland than in the entire Roman Empire. These bogs were «Worlds apart» — dangerous items, hidden treasures, and even sacrifices would end up here. In addition, these bogs are palaeoecological laboratories hardly matched anywhere else.

A high water table in the Seven Seas is the result of a warm climate melting the Polar ice-caps. In lakes, a high water table is the result of precipitation, which may relate to temperature. Cold periods are usually dry, as the Alpine sea-shore dwellings of the Neolithic and the Bronze Age reveal. In fact, there is much archaeological evidence on climate, such as wells in the Netherlands informing of a dry 10th century AD; the changing northern boundary of agriculture in Norway and Sweden; or, the general worsening of climate in Europe around 4000 BC, corresponding to an expansion of settlement onto marginal regions and areas, emergence of social stratification, novelties in technology (including metals), astronomical observations, and even a new gracile type of *Homo sapiens*.

Massed historical records of climatic extremes from the days of the Roman Republic and Empire may provide evidence of trends, however uncertain and difficult to compare with other data. The cold and wet conditions during the Republic may actually have been beneficial to the economy of the Mediterranean. Even specific historical events have been evoked like the year of «dim Sun», 536 AD, no doubt the result of a massive volcanic eruption leading to years of poor harvests, the so-called Justinian Plague of 541-42 AD, and to other problems: certainly, the golden days of Late Antiquity were over by then, whatever the reasons.

Observing the way archaeologists are dealing with climate, one cannot escape the feeling that they read weather into their cultural sympathies. The Nordic Early Bronze Age, for instance, a truly golden period with magnificent graves, fine weapons, jewellery in bronze and gold, elegant (and fully preserved) rather sexual male and female dresses, use of precise calendars, rock carvings, etc., is seen as «sunny»

and warm (Randsborg, Christensen 2006). In fact, it was rather cold. The famous rock carvings of the age depict elegant large canoes and cultic scenes and symbols. The were placed along the sea, but are today often found inland due to the rising Scandinavian landmass pressed down by the ice cap: No climatic puzzle here!

Cold land studies

Studies of the advances and retreats of the glaciers of the high mountains of the World through millennia seem to give rather reliable information on changes in temperature; results which correspond with other evidence (Randsborg 1990). We note a pronounced warm period around 2000 BC, no doubt beneficial to an area like Scandinavia, followed by marked cooling. The last centuries BC — the Hellenistic period and the later Roman Republic — represent another cold period, while Imperial Rome (like Classical Greece) was warm. Other cold phases are found around the 9th, the 14th, and the 17th–19th centuries AD.

The Migration period/Late Antiquity sees a cooling and may have been dry in Central Asia; hence the arrival of the Huns, seeking new pastures for their flocks in Europe according to ancient written sources. There are several indications of this period being a rather wet one in Northern Europe. However, there are no indications in the rich Scandinavian, in particular Danish archaeological data that the region was suffering. By contrast, Denmark was an island of stability during the period of West Roman collapse. Anything Danish of this age looks grand compared to the British and Anglo-Saxon kingdoms: a princely Celtic site being of the size of a pre-Roman Danish farmstead, an Anglo-Saxon royal centre being of the size of an average farmstead in Jutland of the same period.

Indeed, one should reckon with two models of social development in Europe, a roller coaster southern one — civilizations and their fall, and a northern, characterized by steady growth. The Germanic Dark Age migrations seem to be dictated by opportunities rather than catastrophes in the homelands. The same is the case of the Viking Age, although by then we have moved from states made up by tributary royal followers in search of land to armies in search of estates: Hence the many Danish place-names in England, and the fact that the English language is larded with Danish words, from thrive, ill, die, to bread, egg, window, fellow, husband, law, love (to promise), and on to Rugby, Derby, and even (New) York. Viking plundering is but a detail, eagerly recorded by the monks since the Norsemen were foreigners and heathen. Even the North Atlantic expansion, although aided by mild climate, was but an attempt to expand a manorial system into virgin country.

Greenland

The highly reliable long-term climatic evidence from the Greenland ice-core, representing year by year records which are not only applicable to Greenland and neighbouring regions but to the entire Globe, not least through studies linking volcanic activity (and darkening of the skies) with lower temperatures, is particularly interesting (Randsborg 1990; Gulløv 2004). These findings have been tested against early English meteorological data, which is among the most reliable of the Middle Ages. One of the many interesting observations from Greenland is the rapid warming at the end of the Ice Age, implying dramatic Global changes in plant and animal

regimes, in turn promoting massive cultural change, including agriculture, dense settlement and soon after towns in the Near East.

Warming followed upon a final cold period around 10 000 BC, Younger Dryas, which was even felt in the Near East, as cool and dry. In the Near East a cultural explosion came next, in the form of so-called a-ceramic Neolithic cultures (soon to turn ceramic), starting a whole new world of large settlements, cult buildings, the first copper tools, etc. Mankind was almost waiting for a Global warning to release a development leading to the first civilizations of the 4th millennium BC.

In Greenland, the first Inuit culture (the Palaeo Eskimo Saqqaq) arrived during a warm period in the late third millennium BC, only to disappear with the arrival of cold weather in the late second millennium. Late Dorset Culture appear in the last quarter of the first millennium AD, soon followed by Norsemen expanding into the North Atlantic during the Viking Age, reaching Greenland at the close of a warm 10th century. Technologically highly advanced and highly mobile Thule Culture, forefathers of the present population, heralded doom for the slow Palaeo Eskimos. Thule Inuits arrived directly from Alaska, possibly to trade with the Norsemen.

The arrival of human species in Europe during the Ice Age, including Neanderthals and early *Homo sapiens*, were also taking place during warm phases. However, the rise of the remarkable Upper Palaeolithic cultures with advanced technology and even art was taking place during a very cold part of the Ice Age: challenges met, or, more likely, new and culturally far more advanced human groups immigrating into Europe, or even developing there. The frontal lobe sees a new development at about 40,000 BC, which may explain the equally remarkable contemporary cultural development.

Norsemen and their demise

The Norsemen settled in the deep south of Greenland (Gulløv 2004). They established a West European outpost of farmers, and even reached North America (famous L'Anse-aux-Meadows settlement). Contact with North America was crucial for the supply of timbers. The society was explicitly European (also in dress) and Christian right to the end. There was a bishop of Greenland, many churches and several monasteries. Worsening of climate from 1300 AD onwards may have lead to stress on marine resources and to the orderly abandonment of the small Western Settlements to the north (the church bells were removed), as well as to a thinning of the prosperous Eastern Settlement to the south. Nevertheless, the latter also disappeared, by 1440 or 1450 the latest. Speculations have been manifold: a European colony should not just disappear!

Initially, explanations centred on Inuit attacks, but there is no firm evidence. Climatic deterioration was next, including environmental degradation. Again, there is no evidence; no doubt the Norsemen in Greenland were well off in terms of food, shelter, clothing and other culture right till the end. They maintained their Christian Norse farmers' life-style, the last of them still buried in up-to-date European fashions of the second quarter of the 15th century. Also diseases and many other bio-environmental explanations are left unconfirmed. Around 1400 there were many abandoned farms in Scandinavia (including Iceland), due to population decline in the vague of the Black Death. The Norsemen may simply have decided to leave, being as active at the very end as when they first arrived in Greenland. In addition, the major «cash

crops» — Walrus tooth, lost in importance in the 14th century due to arrival in Europe of elephant tusks, in particular from the Mali Empire in West Africa.

At any rate, boats from Scandinavia were becoming rare, while at the same time British and other nations were starting high sea fishing in the North Atlantic to supply their growing towns. If we take Iceland for a model, we note English plundering of the island, abduction or hiring of young men, even installation of English bishops. Applying such a model to weaker Greenland, lack of young men alone (whose genes supposedly are now walking the streets of Bristol or Hull) would have lead to rapid demise. Orderly abandonment or abduction of young men: at any rate, climate cannot be held responsible.

The warmer north

Attempting to understand the Late Medieval crisis in contemporary Europe, we encounter similar problems. This crisis has also been discussed in terms of climatic deterioration – no doubt a factor, but there were others. Population decline is a reality, in the wake of the Black Death of the mid-14th century, change in structure of settlement, and change of production as well. Migration to the towns and to various trades and other activities also played a role, in particular in Central and Western Europe, where towns were larger than in Scandinavia.

As to production, growing of cereals was reduced and stress put on animal husbandry, no doubt with a view to shortage of man-power as well as to the urban market. Thus, Denmark became a large exporter of cattle to North German towns. Manor houses, large as small, were detached from the villages and became model farms, geared towards export. The common farms, now of standardized size, remained in villages. Some villages were even abandoned, as isolated churches demonstrate.

Contemporaries may have described all this in graphic terms, but it was rather a matter of adjustments. If a single cause is looked for, it is the Black Death. At any rate, the Late Medieval example demonstrates rather clearly the difficulties of interpretation when dealing with climate in history. Figures regarding farm numbers, and size and payment of rent (in grain) rendered in time lines are a point in case (Randsborg 2009: 151, table 5).

Politics and science

A couple of decades ago fear of another Ice Age dominated; these very months it is probably the financial and economic crisis. A glacial episode will no doubt arrive, but for the moment this anxiety has subsided. Pollution, acutely encountered in Beijing and other Chinese cities, and in particular Global warming has won much attention, perceived as stemming from carbon emissions due to enhanced human production and consumption of energy in the form of fossil fuels. Nobel Peace-price winner of 2007, A. A. Gore (1948-), is an advocate of joint political action, such as the summit climate meeting in Copenhagen in 2009.

An outspoken «sceptical environmentalist», Dane Bjørn Lomborg (1965-), with team, has become famous by naming World priorities in cost-benefit analyses (cf. the immensely costly Kyoto Protocol). Political hot spots are often the most difficult to address. Lomborg states and sets out to prove by highly acknowledged data that environmental trends are generally positive, which is not to say that everything is

well. He does *not*, however, attempt to argue that Global warming is fiction, or that it is *not* caused by man's carbon emissions.

In such public and highly sensitive field one should also pay attention to a politically silent Dane, Henrik Svensmark (1958-), heading a research team from the Danish Space Centre (Randsborg 2009). Svensmark has revitalized a theory about the influence of cosmic radiation (from exploding stars) on the climate and even been able to prove his points in experiments. The group has (in spite of stiff opposition in particular from Anglo-Saxon scholars) convincingly demonstrated that there is a strong positive correlation, over millions of years, between cosmic radiation and low cloud cover: low clouds implying a cooling of the atmosphere.

Cosmic radiation has dropped by 15% over the past 100 years, which, according to Svensmark, fully explains the recent rise in average temperature of 0.7°. The political fall-out from the findings of this team is still to be observed. Seemingly, there is no response to the findings from the followers of A. A. Gore.

Conclusions

What seems quite clear from the very long record of archaeology and history is the impressive, even encouraging, ability of human beings to adapt to changing circumstances: In particular if war is avoided and miserable, even dangerous, leaders and administrators kept firmly at bay, as — almost — in the democracies. Ideological scepticism is helpful, while at one and the same time exactly ideology and religion are important elements of direction and consolation.

More than five thousand years ago Danes went to the Alps and back in search of copper, while well-dressed Alpine men armed with bow and arrow — and a modern copper axe, crossed the Alps at ease (Scarre 2005). Boats plied the Eastern Mediterranean, and in Mesopotamia city life had already begun, with scribes recording economic and other matters: Would anyone from the caves of the Ice Age have guessed that?

Post-glacial warming was the one most important climatic factor in human history. The most important cultural factor is mankind's remarkable ability to deal successfully with challenges — climatic, as well as other.

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