

Celtic emigration to North America: Climate and colonisation, a case study of failure and success in early Welsh colonies.

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The study and study objectives: The study examines the history of three Welsh colonies founded during the coldest period of the Little Ice Age (1580-1680; IPCC, 1980) i.e. at Cambriol, 1617, Newfoundland (47° N); at Swanzey, 1662, Massachusetts (45° N); and at Philadelphia, Pennsylvania, 1682 (a small collection of colonies, 40° N). The settlement attempt at Cambriol (Williams, 1924) turned into a disaster and was abandoned after 20 years without leaving any trace. Swanzey and Philadelphia survived and prospered (Williams, 1945). The objective of the case study was to elucidate to what extent the climate played a role in the demise of Cambriol and whether or not other social and local environmental factors increased the risk of failure compared to Swanzey and Philadelphia.

Methodology and data acquisition: There are no quantitative records to permit the assessment of temperature at the time that the three colonies were settled. The mercury thermometer was invented by Fahrenheit in 1714 and continuous measurements of temperature only commenced in North America during the mid 18th century. The definition of 'cold' or 'colder' was subjective and based on previous experiences of winters in Wales and other European countries. However, the colonists did keep records of snow cover depth and duration to some degree. To obtain some idea of the snow conditions at that time we have used historical records compiled by Ludlun (1966). We have also examined ice-core records (Alt, 1985). Other historical data were obtained by consulting various works on Welsh colonies in America (e.g. Williams, 1924; 1945) at the National Library of Wales in Aberystwyth, Dyfed, Wales.

Results and Discussion: The records show that the first emigrants were completely unprepared for the climate they encountered. Some settlements (e.g. St Croix, French, 1604-5, 45° N; Sagadahoc, English, 1607-8, 44° N) were abandoned after the first winter (Ludlun, 1966). Severe winters at that time must have been colder than those of the present century as the colonists recorded that conditions were 'very cold', or 'much colder', compared to their previous experiences of winters in Europe. This, at the time that Europe was experiencing the "Little ice age" (IPCC, 1980). A comparison of the extensive records of ice and snow conditions in the region of New England (42 to 45° N) during the 17th century (Ludlun, 1966), shows that the area experienced both mild and severe winters. The depth and duration of snow, and particularly the ice conditions in rivers and bays, suggests that the area may have been frequently experiencing the type of conditions that are found along the lower St Lawrence Valley (Quebec, 47 to 48° N) today. Support for this hypothesis is given by the description of certain severe winters in Massachusetts by John Winthrop (Ludlun, 1966). Temperatures at Cambriol would have been appreciably lower than those which caused these conditions in New England. Alt (1985) determined that during the period 1550-1620 glaciers were advancing in northeastern Canada and ice was encroaching down the coast of Labrador to the Atlantic seaboard. Thus Cambriol (1617) would have experienced more severe winters than New England. However, we could not find any record that would have allowed us to directly compare the Cambriol site to New England. The severe winter of 1628 which almost decimated Cambriol (Williams, 1924) is not mentioned in the New England records compiled by Ludlun (1966).

However, the certitude that Cambriol had much lower temperatures than Swanzey and Pennsylvania at that time can be questioned as the present winter 0°C isotherm (January) for North America swings southward from the Avalon peninsula (Cambriol) and the Atlantic provinces of Canada, through New England (Swanzey) and westwards through Pennsylvania and Ohio towards the mid-West. On the other hand the fact that a similar, but lower, isotherm would have followed the same path in the "Little ice age" is not known. In addition, a comparison of regional climates based on the continental isotherm can be misleading. In fact, the amount of snow on the ground is greater, and the duration

of the snow cover is longer, at the present site of Cambriol than at those of Swanzey and Pennsylvania (McKay and Gray, 1981). From ice-core data which show large increases in snow accumulation for the higher reaches of northeastern Canada during the Little Ice Age (Alt, 1985), we consider that the present-day differences in snow cover were accentuated at that time. Thus, mean winter temperature alone was not the overriding factor in the demise of Cambriol. The critical factors were rather snow cover, its effect on the growing season and the fertility of the soil. Present synoptic conditions and snow cover characteristics which lead to a shorter growing season at the Cambriol site were even more severe during the Little ice age. Even today the thin humic soil at the Cambriol site is about 10°C cooler in summer than the deeper more fertile soils at Swanzey and Philadelphia.

Finally we cannot ignore the social aspects of colonization in the success or demise of the settlements, Social structure, religion and community welfare were the essence of early colonization. The colonists at Cambriol were tenant farmers from Carmarthenshire (now Dyfed) in Wales. These colonists, living in Wales at near-starvation levels, were sent to Newfoundland to satisfy the fantasy of a cultured aristocrat, Sir William Vaughan who had no leadership. They were left essentially to their own devices with no leader. The fact that the colony survived for 20 years is remarkable considering the climatic and social context of the time. In contrast, Swanzey and Pennsylvania, the more southerly colonies, were founded as religious settlements in warmer climes and had zeal and leadership (Swanзей, baptist, leader John Miles; Philadelphia-Pennsylvania, quaker, leaders William Penn and Thomas Lloyd). In addition there existed a primitive form of infrastructure based on contact between neighbouring colonies in the southern colonies which did not exist at Cambriol e.g. the support of the Pilgrim fathers' at Plymouth for the Swanзей settlement. Morison (1965) has, in fact, pointed out that in the case of the Pennsylvania colonies there was some form of this type of infrastructure. He attributed, at least in part, the success of the Pennsylvania colonies to the fact that several hundred Swedes and Finns, the survivors of New Sweden, already present in the region, produced food that ensured the early colonists did not endure hardship in the early years.

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