HOLOCENE SOIL EVOLUTION IN CORNWALL – DO HAZEL NUTS IN ALLUVIAL TIN WORKINGS PROVIDE AN INSIGHT ?

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The common hazel (*Corylus avellana*) bears poor crops of nuts in areas of acid soil, such as are generally found in Cornwall today. Early Holocene vegetation remains seen in alluvial tin workings such as Happy Union in the Pentewan valley often contain an abundance of nuts. This is attributed to early Holocene soils containing carbonate derived from a layer of loess laid down over Cornwall in the late Devensian, making the soil alkaline. This suggests that major changes in the chemistry of the soil have taken place during the Holocene.

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INTRODUCTION

The common hazel (*Corylus avellana*) grows in present day Cornwall, but generally does not bear heavy crops of nuts. This is probably because soils in Cornwall are usually acid (typically pH 5.0-6.0) and an alkaline soil is needed for prolific nut production. Experienced horticulturalists (Chris Page *pers. comm.*, 2004.) know that, in an area of acid soil, a liberal addition of ground limestone on the ground above the roots of a hazel bush will enhance nut production.

EVIDENCE OF HAZEL GROWTH IN ALLUVIAL TIN WORKINGS

However, it appears that, in the early Holocene, Cornish soils were able to support hazel bushes which bore prolific quantities of nuts. The evidence for this comes from the many detailed late 18th – early 19th Century accounts of the sequences seen in the workings for alluvial tin. These sequences cover the time interval between the closing phase of the last glaciation (Younger Dryas) up to the present day. The most famous were the two workings in the Pentewan valley, described in many contemporary accounts (Anon[Raspe], 1794; Lipscomb, 1799; Bonnard, 1804; Smith, 1817; Colenso, 1832; Winn, 1839). Both workings originated as a single operation opened in 1780. Happy Union then worked southwards down the valley and by 1829, shortly before closure, was working 'tin ground' just north of Pentewan (SX 018 472) at a depth of about 10 m below low tide level (Colenso, 1832). Wheal Virgin worked upstream towards St Austell and closed slightly later (Winn, 1839). The stratum of interest to the tin streamers was the basal layer of the sequence, known to the tin streamers as the 'tin ground', which is a chaotic poorly sorted mix of clay, sand, gravel and boulders containing a substantial amount of cassiterite. Camm (1999) interpreted this as a form of high density mud flow produced by a combination of gelifluction and fluviatile processes in the closing stages of the last phase (Younger Dryas) of the last glaciation. Above the tin ground was a layer described by Colenso (1832) as 'decomposed vegetable matter', containing wood (hazel, oak, etc.) and large quantities of hazel nuts. Most of the contemporary descriptions comment on the abundance of hazel nuts in this layer. Camm (*pers. comm.*, 2005) reported that this nut-containing layer was also found in offshore drilling for alluvial tin in the buried channels under St Austell Bay. Seasand overlay the nut-containing layer of vegetable matter in the Happy Union working, but upstream in the Wheal Virgin working no marine strata were encountered.

A brief review of the literature describing alluvial tin deposits in Cornwall (summarised in Henwood,1873) showed that this vegetable layer with hazel remains was encountered in many other alluvial operations in Cornwall, notably those which worked the deeper and more complete sections (Figure 1). This raises the question of why hazel nuts grew prolifically in the early Holocene, when present day soils in Cornwall are normally acid?

THE LATE QUATERNARY IN SOUTH CORNWALL

To answer this we must digress into Quaternary geology. On an Ussher Conference field trip in 2002 along the coast from Carlyon Bay to Par (Bristow and James, 2002) the presence immediately under the soil of a layer of yellowish-brown silty material was demonstrated, varying in thickness from about 10 cm up to 1 m. Particle size analysis showed that this material has a size distribution similar to loess. Some clasts are mixed in it, often with their long axes upright, which suggests that cryoturbation has caused some of the underlying material to be drawn up into the loessic material and mixed with it. This layer of loessic material is represented more strongly in the Lizard and is referred to as 'The Lizard Loess Member' (Scourse, 1996). It is also possible that much of the material called Head in Cornwall may contain a significant content of loessic material mixed in by cryoturbation.

There is general acceptance in the soil science literature that material of aeolian origin can form a significant component of present day soils in south-west England (Findlay *et al.,* 1984) and that soils have evolved considerably since the end of the last glaciation.

Where did this layer of loessic material deposited towards the end of the Devensian ice age come from? Catt and Staines (1992) suggested, on the basis of a study of the mineralogy, that dust blown from the exposed sediments on the floor of what is now the Celtic and Irish Seas, during a particularly dry period, was the principle source of the loess. Because of the lowering of sea level by over 100 m at the end of the Devensian (*c.* 20,000-15,000 B.P.), this would have been dry land at that time. Further research by Scourse (1996) has supported this idea; *"Outwash material associated with this advance on the exposed continental shelf, admixed with marine sediments, was*