

# Isotope Analysis of the Coppergate Skeletons

Gundola Heike Muedner

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YORK ARCHAEOLOGICAL TRUST  
finding the future

### **Why are archaeologists interested in diet?**

Eating is one of the necessities of life and a healthy diet is essential for our well-being. Nevertheless, what and how we eat is not simply a matter of individual taste. Whether we are aware of it or not, our choice of foods, how we prepare them, where, when, and with whom we consume them is greatly influenced by our own social background, our gender and age, the social group we belong to, our ethnicity, religion or political persuasion. By looking closely at an individual's dietary habits, we can therefore learn a lot about their person and the society they are living in – today as well as in the past.

Because of the strong link between diet and society, archaeologists have always been interested in investigating what humans ate in the past, usually by examining the leftovers of their meals – animal bones or remains of plants – from rubbish pits or latrines.

### **Reconstructing diet from the skeleton.**

A different way of finding out about diet, is by examining the human skeleton itself. Certain diseases, such as scurvy or gout, which are brought about by unhealthy diets, cause changes to the bones that are visible to the naked eye.

Other methods look even deeper than this. Because our body uses the food we eat, not just to generate energy that allows us to move around, but also as "building material" to constantly renew and repair our body tissues, our skeleton contains a wealth of information about diet, which scientists can access through chemical analysis of bone and teeth.

The most widely used method of dietary reconstruction by bone chemistry, is called carbon and nitrogen stable isotope analysis of bone collagen. Isotopes are atoms of the same element but with slightly different weights. Different types of food differ in the number of heavier or lighter isotopes they contain. For example, food from the oceans contains many more of the "heavier" isotopes of carbon (C-13) than food produced on the land. Because these isotopes become incorporated in the skeleton of the consumers of these foods, a person who eats mostly fish or seafood would have many more of the heavier carbon isotopes in their bones than someone whose main diet consists of bread and meat. At the same time, a person who consumes mostly animal products, such as meat, fish or milk, will have many more of the heavier isotopes of nitrogen (N-15) in their bones than an individual who eats mostly foods based on plants.

### **Coppergate Samples**

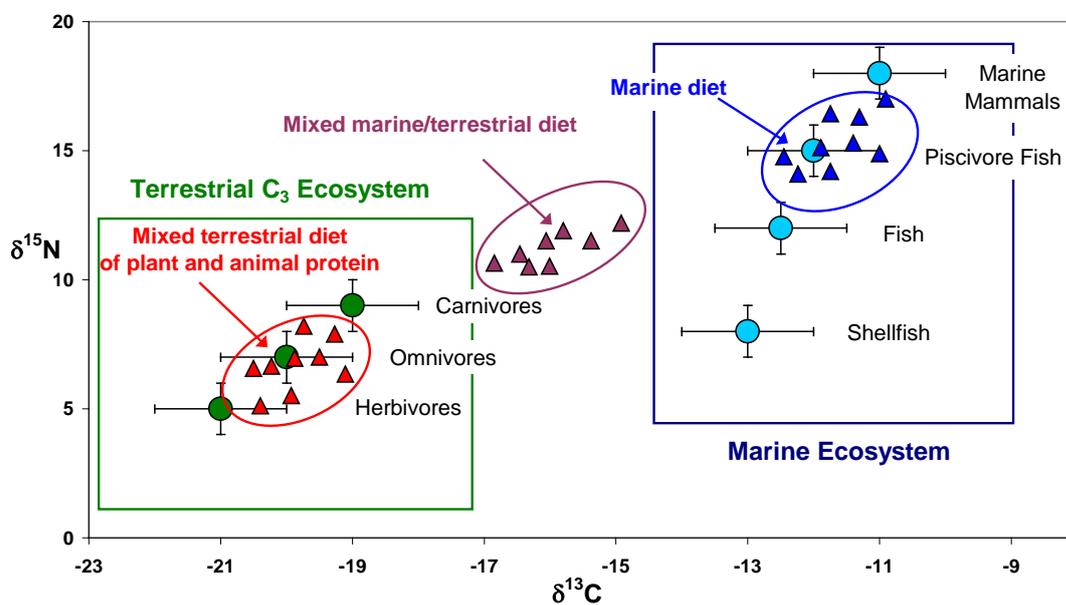
Carbon and nitrogen stable isotope analysis was conducted for three Anglo-Scandinavian humans from Coppergate (SK 15548, SK 30944, SK 36318). The sample material in each case was a small piece of rib (c. 1 cm long). From this bone sample, the protein (collagen) portion was extracted in the laboratory and then analysed for its carbon and nitrogen isotopic composition with the aid of an isotope ratio mass-spectrometer.

Crucially, the samples from Coppergate give the only palaeodietary data available so far from the Anglo-Scandinavian (Viking) period in York. They allow us to examine the common stereotype that Vikings would have eaten fish.

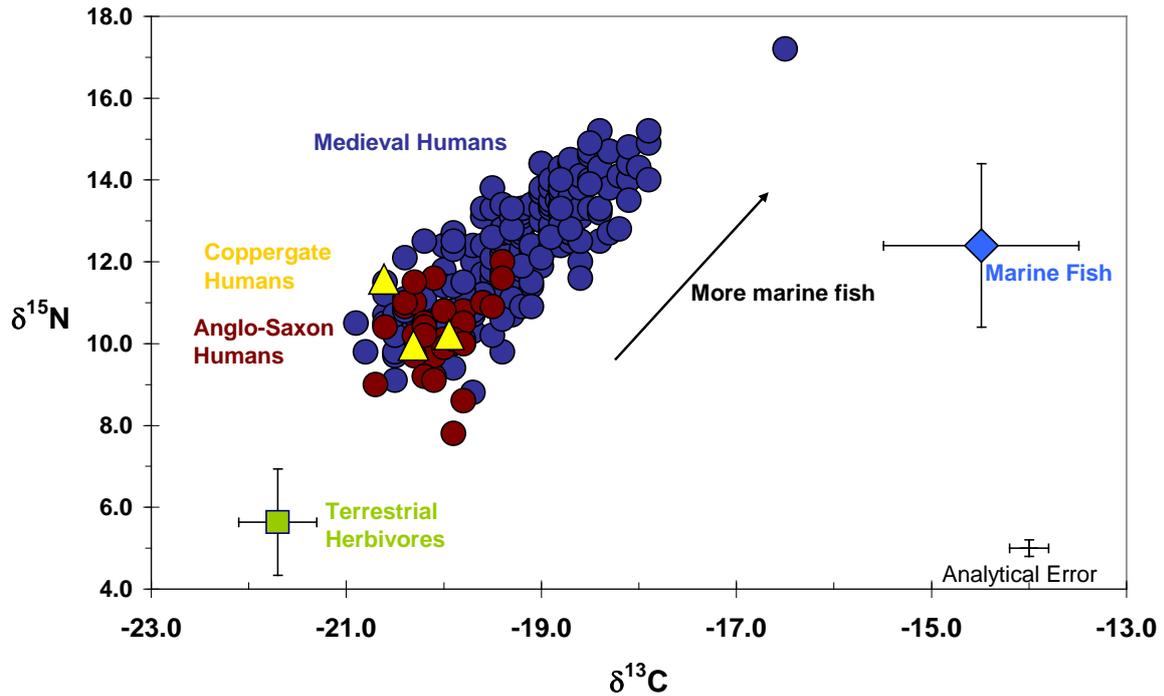
The carbon and nitrogen isotope values from the three Coppergate individuals can be compared with dietary data from other periods of York's history, specifically with the mid-Anglian period (7<sup>th</sup> to 8<sup>th</sup> century AD), when the diet was almost exclusively based on

terrestrial foods and probably some riverine resources, and the Medieval period (mid-11<sup>th</sup> to early 16<sup>th</sup> century), when most of the population consumed some sea fish, in varying quantities, probably because of the fasting rules imposed by the Church and regularly supplied by the Medieval sea fishing industry.

Plotting the humans from Coppergate with the isotopic results from the other populations reveals that their diet was most similar to that of the Anglo-Saxons. They evidently did not consume marine fish in any measurable quantities. These results indicate that the Vikings did not introduce sea fish to everyday diet in York. These conclusions are also supported by the finds of fish bone in archaeological contexts from York, which indicate that marine fish in large quantities only reached the city from the late 10<sup>th</sup> century.



**Figure 1.** Stable isotope scatterplot illustrating the principle of stable isotope analysis for dietary reconstruction: Round symbols show typical  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  ratios for different types of food (error bars indicate typical variation). Triangular symbols represent typical bone collagen stable isotope values for human samples, whose diet is inferred by their position on the graph in relation to potential food sources.



**Figure 2.** Isotope results for the three humans from Coppergate in comparison with humans from the mid-Anglian-Saxon period (cemetery of Belle Vue House, mid-7<sup>th</sup> to mid-8<sup>th</sup> century) and Medieval humans from the cemeteries at St. Andrews, Fishergate (late 11<sup>th</sup> to early 16<sup>th</sup> century). The results show that the diet of the Coppergate humans is most similar to that of the Anglo-Saxons and indicate no measurable input of marine protein to the diet.