6 Seafood and our speciation

He was a bold man that first ate an oyster.

Jonathan Swift

The food we eat – our diet – plays a major role in our lives today, as it did in our long-term evolution as a species. Most of us spend a fair amount of our time thinking about food. The majority of people worry about getting enough to eat whereas the relatively wealthy minority worry about eating too much. Among the poor, access to nutritional food remains a major challenge, with many of those fortunate enough to survive beyond infancy saddled by the lifelong negative impacts of childhood malnourishment. In poor areas of the world, many children suffer stunted growth, and malnutrition is a contributing factor to a third of the 9.7 million children who die each year. Meanwhile, among those having access to abundant food, increased consumption of sugar, processed oils and salt – combined with less active lifestyles – has led to a worldwide obesity epidemic. Ironically, many overweight and obese individuals are also malnourished because the highly processed foods they consume are high in calories but low in nutrients. Food was no less of a concern to our ancestors, whose diet also depended on what they had access to and what they culturally considered to be food. Just how big a role did diet play in the evolution of our lineage and how significant might the discovery of seafood have been in the evolution of our species?

The adage 'You are what you eat' seems to apply when considering the range of diets in our great ape family. Gorillas, with whom we last shared a common ancestor 10 to 8 million years ago, tend to remain in one area of the forest, where they forage leaves. Leaves are everywhere in the forest and easy to grab by the fistful. Gorillas eat lots of fistfuls, all day long, because leaves are low in calories and require a large stomach capable of digesting them. Other, more caloric foods are consumed, such

as fruits and the inadvertent insects living on the leaves, but gorillas, who are much bigger and stronger than us, evolved on a diet of quantity, not quality. Chimpanzees, with whom we last shared a common ancestor 8 to 7 million years ago, eat a mix of low-calorie leaves but also an abundance of higher-calorie fruits and nuts, with insects and the odd monkey, small bushbuck or bushbaby thrown into the mix. Chimps tend to range over a much larger area than gorillas in order to find their preferred foods, which, unlike leaves, are only locally or seasonally abundant. Despite eating more calorie-rich foods, chimps are smaller than gorillas, but in proportion to their overall body size, chimps have a bigger brain than gorillas. A big brain allows chimps to find food, to use tools to extract foods like termites and nuts, and, most importantly, to spend less time eating and more time grooming and socialising as they continually assess their complex relationships to others in their troop.

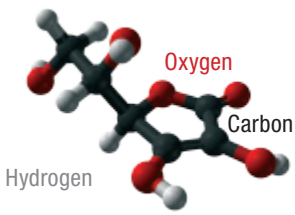
Diet appears to have played a modest role in the initial breakaway of bipedal australopiths from our common ancestor with chimps. Australopiths broadened their diet to include a greater variety of foods found on the forest fringe, but it was in many respects similar to that of chimps. Diet played a much larger role in the breakaway of our genus *Homo* from the australopiths and included an increasing amount of high-calorie scavenged meat and cooked foods as *Homo* took control of fire. The shift from a mostly raw plant diet to a diet consisting of a mix of cooked plants and meat is reflected in a reduction in the size of our gut, muscles, jaw and teeth. Redirecting the energy saved in these reduced body parts facilitated our growing a bigger brain, a growth that depended on a diet increasingly rich in high-calorie foods. We evolved on a diet of quality, not quantity.

We are omnivores, willing to eat almost anything. The higher it is in fat and calories, the more we like it. And with good reason, considering our overall high body-fat content that includes our brain, composed of 60% fat. Despite the strong stance of the US Department of Agriculture against eating fat, it is becoming increasingly appreciated that our bodies need fat, or at least the right kinds of fat. Rather than fats in our diet, some argue that carbohydrates, especially refined sugars, are at the root of many of our recent health crises, such as the rise in diabetes. But the diet for optimal human health remains elusive. Some advocate a pre-agricultural or 'palaeolithic' diet, some follow a raw-food vegetarian diet, others a high-protein diet, while yet others believe that following a calorie-restricted diet enhances longevity. And yet, despite the very different diets people follow, what we eat doesn't appear to radically alter who we are. Indeed, it is striking how long people can live on extremely poor or limited

diets, such as those who appear to live on a diet of mostly alcohol and cigarettes. Yet, although a wide dietary tolerance may hold for adults, it most definitely does not hold in our first thousand days of life.

The first thousand days

Besides the fact that food provides the calories or energy we need to live, food also provides – often in trace amounts – nutrients essential to our growth and development. We must obtain these essential nutrients from the food we eat because our bodies cannot make them. Vitamin C is an example of a nutrient that became essential once our early primate ancestors lost the ability to make it. This loss is not a problem as long as the diet includes fruit and leafy plants rich in vitamin C. People living for extended periods of time without fresh produce, such as mariners or soldiers on a diet of dried beef and salt tack, can suffer and even die from vitamin C deficiency, which manifests as scurvy: lethargy, fever, oozing sores, tooth loss, fever and nerve dysfunction (neuropathy). Other essential dietary nutrients include vitamins A and B12, the omega-3 and omega-6 polyunsaturated fatty acids, and the elements iron, zinc and iodine. Although not getting enough of these essential nutrients may not necessarily kill us, it can seriously compromise our health, particularly if we lack these nutrients in our first thousand days.



Vitamin C

The first thousand days, spanning the 9 months in the womb up until age 2, are critical because this is when our central nervous system grows and develops. Calories and an adequate supply of essential nutrients, such as the omega fatty acids, are not only needed to grow our big fatty brain, but are also critical to ensure our brain is well connected to the trillions of nerves that run throughout our body. A diet deficient in calories or essential nutrients can lead to premature death, while those who survive malnourishment can have compromised development and suboptimal health

Vitamin C (left) is abundant in fruits and a lack of it in our diet can cause scurvy (right)

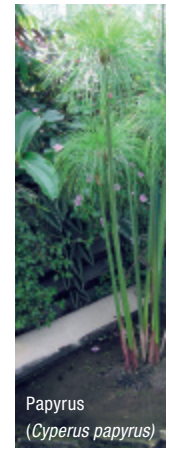
throughout their lives. Once we are 2 or better yet 20 years old, when our brains and bodies are fully developed as adults, we are far better able to tolerate nutrient deficiencies. By adulthood the critical assembly of our bodies is complete and it becomes more a matter of eating enough to keep everything running. Where did our ancestors source the calories and nutrients needed to grow their big brains?

In addition to foraging a wide range of plants and scavenging and hunting animals, our ancestors depended on aquatic foods associated with bodies of water: rivers, lakes, wetlands and the coast. Eating aquatic foods found on the fringe of lakes and rivers is something chimps do today, particularly in times of food scarcity. It is likely that australopiths did the same, as did our earliest human (*Homo*) ancestors, whose fossil remains and artefacts are often found in close proximity to contemporary ancient rivers and lakes. For example, archaeological sites in Kenya show that a rich variety of aquatic foods were being exploited 2 million years ago.

Besides plenty of essential fresh water, rivers and lakes provide a rich array of high-quality aquatic food items, including fish, crabs and frogs; plants with edible parts, such as sedges, reeds and rushes; floating plants like water hyacinth; and submerged plants such as fennel pondweed. Sedges have many edible parts, with the roots (rhizome) and stalk (culm) of papyrus consumed raw by those living on the Okavango Delta in Botswana today. In spawning season, the large catfish *Clarias*, common to many African freshwater habitats and whose bones occur in many archaeological sites, is seasonally hunted with spears today or simply grabbed with bare hands or dug out of their mud burrows during dry periods when water levels are low. Catfish and other freshwater fish, crabs, frogs, clams and other invertebrates were easily captured by our ancestors and provided rich sources of fatty acids essential to their brain growth.

Okavango Delta from space

Okavango Delta



Catfish (*Clarias gariepinus*)

Papyrus culms

Wetlands, such as the Okavango Delta, are rich in high-quality foods that include catfish (*Clarias*) and papyrus culms