

THE CHARLOTTE WHALE

A 10,000-12,500 YEAR-OLD POST-GLACIAL ANCESTOR OF MODERN WHITE (BELUGA) WHALE~ FOUND IN CHARLOTTE, VERMONT IN 1849

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Historical Background

In 1849, while constructing the first railroad between Rutland and Burlington, Vermont, workman uncovered the bones of a strange animal in a swampy area northwest of Mt. Philo in Charlotte, Vermont. First thinking the bones to be those of some type of horse, the workman continued to dig, shattering much of the skull and carrying pieces away with the removed dirt. It wasn't until a local resident, John G. Thorp, happened upon the site and recognized the bones to be those of an animal unfamiliar to 19th Century Vermont, that digging was temporarily discontinued.

While the workman continued their excavation at a different location, Zadock Thompson was called in from the University of Vermont to investigate the site. Thompson was well known locally as a man of science, and as the author of "Thompson's Vermont", a chronicle of Vermont natural history. Thompson made two trips to the site, laboriously removing the bones from the dense blue-grey clay in which it was imbedded and carefully collecting bone fragments from the piles of discarded dirt. He then took them back to his laboratory and reconstructed the skeleton, using knowledge of comparative anatomy gained from preparing and mounting the skeletons of many animals from the Champlain Basin. After consulting Georges Cuvier's classic 1825 work on fossil bones and seeking the advice of Harvard Professor Louis Agassiz, Thompson decided the specimen closely resembled that of a modern white whale and proposed the provisional name *Delphinus vermontanus* until the exact relationship could be determined. (1)

The skeleton that Thompson pieced together can still be seen just inside the main entrance to the Perkins Museum of Geology in Delehanty Hall on the University of Vermont's (UVM) campus. Housed in the oak and glass case built for it before the turn of the century, the original wires, labels and reconstructions of wood and burlap are visible. The careful observer will note that the present reconstruction is not completely correct. For example the placement of the front scapula (shoulder blade) and the arrangement of some of the ribs and vertebra are somewhat in error. In addition, Mr. A. D. Hagar, curator of the museum collection in the 1860's, reconstructed the bones of the head in such a manner so as to obliterate the original configuration of the historical material.(2) However, since the skeleton is considered to be a more important historical specimen than an anatomical one, no further reconstructions are planned. For now at least, the initial efforts of Thompson and Hagar will stand.

Unfortunately, because Thompson immersed the bones in an "animal glue" to strengthen them and preserve them from desiccation after removing them from the clay, it is not possible to establish the age of the specimen through Carbon14 dating. Presently, we are only able to say with any certainty, that the whale lived at some point during the 2500-year span of the Champlain Sea. Other means are being sought to establish a more precise age.

Geologic Background

For many hundreds of thousands of years, New England was covered by a succession of huge glacial ice sheets that advanced and retreated over the land, grinding the surface and leaving behind deposits of sand, silt and gravel. Some of these ice sheets were in excess of a mile in thickness and the weight of this enormous mass depressed the surface of the land in much the same way that a floating log sinks lower in the water when a turtle climbs upon it. Approximately 12,500 years ago, the last of these glacial sheets retreated far enough north to allow the marine waters of the Atlantic Ocean to flood into the Champlain Basin, which was then depressed below sea level. For 2500 years following that, this region existed as an arm of the Atlantic Ocean known as the Champlain Sea, a body of water that covered 20,500 sq. miles extending southward throughout the Champlain Valley of Vermont and New York and as far north as the present city of Ottawa, Canada. Into this sea moved a variety of marine animals including mollusks, sea urchins, squid, herring and cod. Following these animals came a number of mobile predators including salmon, seals and white whales.

Careful analysis of sediments deposited in the Champlain Sea indicates that by 10,000 years ago, the land in the Champlain Valley had rebounded sufficiently (like the log floating higher in the water once the turtle finally jumps off) to raise it above sea level and end the influx from the North Atlantic. The brackish waters of the basin drained northward into the St. Lawrence river and was slowly replaced by fresh water from the local rivers and streams. It was at this time that the present Lake Champlain was born. Evidence of this glacial rebound can be seen in the fact that the mean level of Lake Champlain is now 95 feet above sea level and the Charlotte whale was found another 60 feet above the level of the lake.

White Whales

The White Whale (*Delphinapterus leucas*) is known by a variety of names including "beluga", "white porpoise", "white squidhound" and "sea canary". It is a toothed whale recognized by its brilliant white to grey-white color, prominent forehead knob or "melon", and lack of a dorsal fin. It is distributed in the coastal waters of polar/boreal areas, and frequents a number of habitats from open arctic waters, to the calving edges of glaciers, to the brackish waters of estuaries and river mouths. As a frequent inhabitant of estuaries and rivers, white whales are clearly more tolerant of fresh water than other whales. The present population of white whales, numbers between 40,000 to 50,000 animals. This includes a small and rapidly declining population of approximately 500 in the Gulf of the St. Lawrence (Evans, 1987).

The remains of seventeen fossil white whales found in Pleistocene clay and sand deposits in eastern Ontario, Quebec and Vermont indicate an extensive distribution in the Champlain Sea approximately 11,000 years ago (Stewart, 1989). The Charlotte whale contains the most complete post-cranial remains of the Champlain Sea specimens yet found south of Canada, and although

unearthed almost 150 years ago, the circumstances surrounding its discovery are well documented and of continuing value (Thompson, 1850, 1853; Perkins, 1908).

Present understanding of the Charlotte Whale

During the summer and fall of 1992, a group of researchers from the Geology Department at the University of Vermont (3) combed old maps, records and articles in an effort to locate the original site of the Charlotte whale. Even though the original distances recorded by Zadock Thompson (Thompson, 1853) proved to be in error, and were based upon a bridge crossing that no longer exists, a locality was settled upon that was estimated to be accurate to within 50'-100', and was representative of the local environment. The designated site lies near the base of the western side of a small sandy hill (approximately 50' - 60' tall) that occupies the south end of a long, north-south trending ridge. The land opens out westward from this point into low rolling fields for approximately 1/2 mile, rising again to a less prominent north-south ridge. Exposed bedrock on this second ridge is a dense siliceous limestone, locally deformed, that dips gently to the east. From there the land drops steadily for another 1 1/2 miles towards Barton's Bay of Lake Champlain.

The whale was reported by Thompson (1850, 53) to be found 8' -10' below the surface of the land in a layer of sticky blue-grey clay that underlies much of the region. The head of the essentially intact skeleton lay lowest and was encountered first, with the rest of the body and tail extending towards the SE, obliquely upwards into the blue clay. Thompson also reported finding bits of plant material along with the specimen and interpreted this to indicate a "quagmire" or "salt marsh". Hand auger cores taken from the site in November of 1992 also found remains of carbonaceous materials although these materials have not yet been identified. Although subjected to surface erosion over the last 10,000 years, the local topography suggests that the whale site was potentially a shallow near-shore estuary at the edge of a small island or underwater ridge. The present drainage pattern tends towards the south and west.

Shell fossils such as *Mya arenaria*, *Saxicava rugosa*, *Mytilus edulis*, *Sanguinolaria fusca* and *Nucula sp.* were found in association with the skeleton (Perkins, 1908) and can also be found in many areas throughout the Champlain Basin, indicating shallow marine environments. Using these shell fossils, marine beaches have been interpreted to exist as high in elevation as the base of Mt. Philo and as low as 20' above the present Lake Champlain beach. Fragments of these shell fossils were also pulled up in the recent coring efforts.

Because of these varying shore levels, and because there is presently no way to precisely date the whale within the 2500 year interval of the Champlain Sea, it is not possible to determine exactly how deep the water was at the whale site at the time of the whale's death and therefore the exact nature of its environment.

Thompson's interpretation of a salt marsh is problematic because of the presence of the fine blue clay, generally an indicator of a deeper depositional environment. These clays could however, be redeposited upland sediments from an earlier, deeper fresh water glacial lake known as Lake Vermont, possibly traveling no farther than the small hill to the immediate east of the site.

There is no evidence at the whale site of beach sediments and so the popular conception

that this whale "beached" itself is unfounded. What is most likely is that the Charlotte whale died in shallow water in a marshy area near shore where it was not subject to predators and was slowly covered by fine sediment. There have been no observed teeth marks on the bones to indicate scavengers, and the bones were found in perfect alignment indicating that they were not scattered following death. The periotic, a bone of the inner ear, was found with the specimen and agrees favorably with those of the modern white whale although much smaller.

Observations on tooth wear and the suturing of head bones however indicate that the Charlotte specimen was a fully-grown adult. Although the sex of the specimen is not known, generally only females and their young come into shallow near-shore areas, with the rest of the herd remaining in open waters. Consequently, there is a high probability that this fully grown adult is a female of the species.

Little is actually known about the vertebrate populations of the post-glacial Champlain Sea, although some comparisons can probably be made with the present biota of the Gulf of St. Lawrence. The bulk of our knowledge comes from isolated fossils preserved in concretions and occasional bone fragments that show up in the Champlain muds and clays. Only rarely is a fossil the quality of the Charlotte whale is discovered. Current work on the sediments of the Champlain Sea by researchers at the University of Vermont and elsewhere are providing us with the means to more accurately chart the minor changes in climate and water characteristics over the years and to date these events more precisely. With advancing technologies, the Charlotte Whale and other like it will continue to yield insight into ancient environments.

Does the finding of one whale skeleton in a field in Charlotte, almost by accident, mean that others could potentially be found in the area? The answer to this is most certainly "yes". However, because our excavation mechanisms have become so modernized, we now dig up the ground at an unprecedented rate and no longer look as carefully as we once did. Once the ground has been distributed, it provides little use to investigative science. Who knows how many other important fossil specimens have and will be destroyed in the process?

Jeff L. Howe is author (Feb. 2104) of
HOW DO YOU GET A WHALE IN VERMONT?

The Unlikely Story of Vermont's Official State Fossil

Howe explains how a 12,000 year-old whale fossil ended up buried beneath a Vermont farmer's field, 200 miles and two mountain ranges from the nearest sea.

(1) Although observed dental and vertebral formulae reported on this skeleton differ significantly from those of modern white whales, enough variation occurs within species and genera of Cetacea to account for the difference. There is presently insufficient evidence to indicate that the Charlotte whale has experienced sufficient genetic isolation from modern populations to warrant its designation as a distinct species or subspecies. The present designation stands as "*Delphinapterus leucas*", or that of a white whale.

(2) Perkins (1908) quoting Hagar: "the outline of the head, therefore, may not be true to nature, but the writer, acting in the capacity of curator, concluded that an artificial head...even if not a perfect model of the original, would be more attractive to visitors than the remaining portion of the skeleton would be without a head."

(3) J. Howe, S. Bechtel, M.A Schlegel, R. Trithart, S. Wright