FOSSILARIUM

A museum for the whole family, where science and fun come together

The Témiscamingue Region's Fossil Families

Paleontology or archeology?

Paleontology is the scientific study of plant and animal life and their traces over the ages. It covers a longer period than archeology, starting from the first remains, which date back 3.5 billion years, up to just a few years ago.

Archeology is the study of humans and the traces that they have left over millions of years (roughly 4 million).

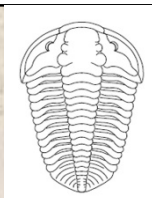
In some cases, the two sciences intersect when, for instance, analyzing the fossil remains of animals that have been eaten by humans or when studying our human ancestors.

Geology in the Témiscamingue region

The Témiscamingue region's geology dates back to the origins of our continent, between 2.6 and 2.8 billion years ago.

It is characterized by underwater volcanic rock, fossiliferous limestone that is between 420 and 460 million years old, and a stepped fault system called a rift valley, which played a major role in preserving these layers by protecting them from glacial erosion.

Life under the sea … over 450 million years ago



Trilobites

Creatures with articulated legs

Origins

Trilobites date back to the Cambrian Period, roughly 523 million years ago. These arthropods are related to insects, spiders, and crustaceans (lobsters, etc.).

Characteristics

They were protected by a shell made of chitin, which is just like the substance found in our fingernails. Only the top surface of this shell was hardened by calcium. That's why, when faced with danger, arthropods protect their abdomen by rolling into a ball. Their legs and antennae were not mineralized, so their remains are rarely found.

Trilobites are named after the way their bodies were organized into three vertical lobes. Eyes could be simple or compound, like flies, while some trilobites were blind. Because they moulted to accommodate growth, we now most commonly find shell fragments.

The Ordovician period (460 million years ago) was the golden age for trilobites when a string of species developed in quick succession. As a result, this type of invertebrate has become a precise and valuable marker for dating rock layers from that period.

During the glaciation that ended the Ordovician period, a large number of families disappeared. The last ones died out at the end of the Permian, 250 million years ago, at the same time as 90% of marine life. This extinction was even greater than the one that wiped out the dinosaurs.

In the Témiscamingue Region

The Témiscamingue region has few trilobites, and little Ordovician species and specimens. The Silurian is more prominent, including nine genera, but complete specimens are rare.

Here are some specific trilobite species:

Ordovician

Bumastus trentonensis
Ceraurus dantatus
Isotelus gigas

Silurian

Encrinurus cf ornatus
Encrinurus sp.

Trilobite pygidium
Encrinurus sp
Silurian
Haileybury, Ontario

Stromatolites

Reef-building cyanobacteria

Origins

Stromatolites are the oldest life forms ever found. They have been around for at least 3.5 billion years.

Characteristics

They are made up of laminae:

- A cyanobacteria sheet carries out photosynthesis, growing as a horizontal chain at night
- Another sheet grows vertically during the day to trap particles, creating a sediment layer

These accumulations develop into bulbous structures in the tidal zone and, today, they make up fossilized reefs that span up to 3 km in width, as seen in Morocco's Atlas Mountains.

Stromatolites, using CO2 and releasing oxygen as waste, arguably created much of our oxygen-rich atmosphere and the ozone layer, as these two gases allowed for the development of more complex life.

In the Témiscamingue Region

Paleontologist Thomas Bolton took a photo of these structures, which date back to the Silurian era, 420 million years ago.

Today, stromatolites exist in limited places, like Australia's Shark Bay, where highly saline water (7%) protects them from grazing organisms. You may also see remnants of stromatolites the next time you go to Gatineau.

For more information:

http://geo-outaouais.blogspot.ca/2013/03/stromatolites-exceptionnels-presque

Dome-shaped stromatolites
living in deep waters that protect them from tides
Donated by Laurentian University, in Sudbury
Gymnosolen microbialites
Precambrian
Sault-Sainte-Marie, Ontario

Crinoids

Plankton lovers

Origins

They are a part of the echinoderm family, which first appeared in the early Cambrian period, 540 million years ago.

Characteristics

Even though they are called sea lilies and look like plants, crinoids are in fact animals with organs. Each one has a curious five-sided symmetry, like its cousins, starfish and sea urchins. Plus, as crinoids are closely related to chordates (animals with a notochord or spine), they are in fact one of our distant relatives.

Crinoids have a unique system that maintains water pressure in the shaft and in the arms, to keep them straight. Their arms are used to breathe and to feed on plankton and suspended particles.

In the Ordovician and Silurian periods, crinoids made up vast grasslands in shallow seas. Today, they generally live in tropical seas, although a few species inhabit the North Atlantic, from Portugal to Norway.

Crinoid fossils can be several metres tall. Current species do not exceed one metre.

In the Témiscamingue Region

Here, crinoids were especially common in the Silurian period. Several species exist. Two specimens from the Témiscamingue region, a discovery made by the Fossilarium, are now being studied at the University of Cincinnati. They are likely completely new. The Pointe Dawson Cliff was primarily built by these crinoids.

Certain rock layers in the Témiscamingue region are made up of crinoid rings (up to 90% crinoid rings)
Crinoidea
Silurian
Île Mann, Quebec

Stromatoporoids

SPONGES WITH A SKELETON

Origins

They appeared 540 million years ago and practically disappeared 360 million years ago. Only sclerosponges, a derived form, still exist.

Characteristics

Stromatoporoids, meaning “beds with holes” in Greek, are organisms with a layered structure, perforated by perpendicular canals. They would develop an outer skeleton made up of solid limestone.

Like their relatives, the modern soft-bodied sponges, they had no organs. Food would pass through openings and channels leading to individual digestive cells. Other cells were also individually responsible for distributing nutrients.

Between 460 and 420 million years ago, reefs were not only made up of coral. Stromatoporoids, ancient coral, and stromatolites formed large reefs that could extend over more than 1000 km like the one found in Gaspésie’s Appalachians, which date back to this period.

In the Témiscamingue region

Several locations provide an exclusive reef environment made up of coral and stromatoporoids. The Fossilarium organizes guided outings to admire this ancient tropical environment and to collect specimens.

Stromatoporoids with elongated strata
Donation made by Paul Copper
Labechia sp.
Silurian
Earlton, Ontario

Stromatoporoid with buds
Clathrodictyon vesiculosum
Silurian
Île Mann, Quebec

Receptaculites

CALCAREOUS (SKELETAL) ALGAE

Origins

Around 480 million years ago in the Ordovician Period.

Characteristics

Classifying them in a specific family remains controversial. Initially, and for a long time, this group was classified as a sponge. Today, it has become more common to compare it to certain algae, called Dacycladaceae, which also develop globular skeletons. Ultimately, classification will depend on the university or scientist.

Receptaculite shapes, which look like the disc florets of a sunflower, are easily recognizable.

In the Témiscamingue Region

Receptaculite fossils found in the Témiscamingue region are known for their circumference, which can easily reach 24 to 30 cm (10 to 12 inches).

Calciferous (skeletal) algae shaped like sunflower disc florets
Receptaculites occidentalis
Ordovician
New Liskeard, Ontario

Coral

MULTIPLE SMALL STOMACHS

Origins

Beginning 478 million years ago, the first species thrived until the Permian extinction, 252 million years ago. They were then replaced by current species.

Characteristics

With a vegetative appearance and an external mineral skeleton, corals are real marine animals. Each individual (polyp) is a very primitive creature consisting almost exclusively of a stomach which opens into an orifice acting as both a mouth and an anus.

All are clones

Corals generally live in colonies with several beings existing in the same skeleton; initially, a single larva attaches itself, then builds a skeleton around itself. On the second day, it divides into two or three parts, through budding. Over time, hundreds of individual creatures help the colony grow, giving it an inverted pyramid shape in which only the top is alive. All animals (polyps) are therefore twins (or clones).

In the Témiscamingue Region

Today's corals, and perhaps ancient corals as well, often live symbiotically with algae that photosynthesize for them. This particular trait means they primarily live in shallow and well-lit waters. Their abundance in the Témiscamingue Region bears witness to a once shallow sea. The main types of ancient corals can be found in the Témiscamingue region:

Tabulate corals: colonial corals

- Favosites: 6-sided honeycomb-shaped cells
- Syringopora: tube-shaped structures
- Halysites: chains of cells, creating a labyrinth-like skeleton

Rugosa corals

- Solitary Rugosa corals: horn-shaped, with the top split up by partitions

Favosites sp.
Silurian
Manitoulin Island, Ontario

Halycith catenularia
Silurian
Manitoulin Island, Ontario

Syringopora Verticillata
Silurian
Île Mann, Quebec

Brachiopods

STANDING FILTER FEEDERS

Origins

Brachiopods appeared around 570 million years ago. While they were abundant in the past, with 25 000 fossil species found, brachiopods currently number around 350 species. They were replaced by bivalves, like oysters and mussels.

Characteristics

Although they have two valves, brachiopods are not bivalve creatures. While both sides of the valves are similar, the two valves of an individual animal are different; the pedicle (or ventral) valve is larger than the other one, to allow the foot to pass through.

Usually held in place by its foot, which attaches to the sea floor, the brachiopod cannot move around to feed. Its life unfolds in the place in which it became tethered during its larval state, in somewhat deep waters. The lophophore, an internal arm lined with cilia, creates a water current that brings in nourishment and oxygen.

The brachiopod is endowed with many organs including a liver, primitive kidneys, reproductive organs, and a blood vessel that acts as a primitive heart.

In the Témiscamingue Region

Brachiopods from the Témiscamingue region are small, but diverse.

Peduncular (ventral) and flat valve
Brachyprion cf. robustum
Silurian
Route 65, Ontario

Brachial valve from the Thornloe formation
Brashyprion sp.
Silurian
New Liskeard, Ontario

Gastropods

SUCCESSFUL MOLLUSCS

Origins

Cambrian Period, 570 million years ago.

Fossilized gastropods lived between 460 and 420 million years ago; they have been found in Quebec's Témiscamingue region, in eastern North America and in parts of England. During this period, gastropods were exclusively marine animals living near the coast. Today, they are primarily herbivores, sometimes sponge grazers, while others feed on corpses, likely as they did in the past.

Characteristics

Gastropods, like slugs, are molluscs. This means they are the cousins of mussels and octopi (from the cephalopod group). Their shell protects their internal organs. After insects, gastropods form the largest animal group. There are roughly 40 000 living species, the majority of which thrive in the sea. Some of them, like the snail, adapted to live in a terrestrial environment.

The oldest type, the two-dimensional planispiral gastropod, dates back approximately 530 million years. The three-dimensional coiled spiral cone shape appeared in the early Ordovician Period, some 488 million years ago. This spiral shape made the shell more solid. In the Ordovician-Silurian period, the creature's body would twist through this spiral, just like it does today.

Gastropods have many organs: eyes, gills, a locomotor foot, a two-chambered heart.

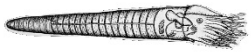
In the Témiscamingue Region

The region is particularly rich in gastropods, found in rocks from the Ordovician Period (-460 million years). There are at least six different species.

Hormotoma major is a good stratigraphic indicator. This means it acts as a strong indicator for this period, even identifying the age of the rock. In fact, it only existed 460 million years ago.

Different colours of mud filling are transport indicators

Macrulites Manitobensis
Ordovician
New Liskeard, Ontario



Nautiloids

THINKERS WITH TENTACLES

Origins

Upper Cambrian, 520 million years ago.

Features

Nautiloids are octopi with multi-chambered shells. The animals live in the last chamber, which is bigger. The shell regularly increases by one chamber (for the nautilus, its direct descendant, this means one for each lunar cycle).

A siphon passes through the empty chambers and allows air to be pumped in. This allows nautiloids to rise up through water layers, to feed at the surface, and then expel air to take refuge in the depths. They lived in the Ordovician period, as the first large marine carnivore to swim freely and the first to have a central brain located in the head, well oxygenated by four sets of gills.

The Ordovician Period is characterized by large nautiloids, some of which grew to be 10 metres long.

In the Témiscamingue Region

The Témiscamingue region is renowned for the great variety in its Ordovician (-460 Ma) and Silurian (-420 Ma) nautiloids. Several of the same genera or species have also been found in Hudson Bay, in the lowlands of the St. Lawrence and in Michigan, which allows us to state that the Ordovician and Silurian sea covered this entire swath of land. The Plectoceras, a rare species that was recently discovered in the Témiscamingue region, further confirms this hypothesis.

Curved chambers and visible siphon
Endoceras sp
Ordovician
Témiscamingue Region, Quebec

Internal casting of a Nautiloid siphuncle
Dicosorus humei
Silurian
Île Mann, Quebec