tis elongata (Figure 5). It was the first fossil from the Falls of the Ohio described in scientific literature (in 1820). This was possibly one of the largest horn corals that ever lived. It is generally thought to lie prostrate on the sea floor (less erect than shown in the diorama), curving upward to catch small organisms with its stinging tentacles. To reach lengths of up to four feet (1.2 meters), meant it had a long life span.

The upper coral zone makes up the bulk of the lower fossil beds on the Indiana side of the river channel. It marks the base of the Middle Devonian (Eifelian stage). Fossil preservation points to a shallower sea than the lower coral zone.

The fossils are broken into fragments from the same tropical storms that only toppled them in the lower coral zone. If you wet down a clean exposure of limestone, look for tightly packed masses of fossil corals – especially worm-shaped pipe organ corals that are intact in the lower coral zone mixed with broken branching corals, honeycomb, and horn corals of different sizes. Only the large stromatoporoid sponges remained unscathed in the shallow water because they grew thin and expansive. The upper coral zone contains crinoids, the rare snail and other assorted fossils that are very difficult to see without wetting the clean limestone and getting down on your hands and knees.

Figure 6A: Wet upper coral zone

Figure 6B: Dry upper coral zone

The reason the upper coral zone looks so dramatically different wet and dry is the limestone contains carbon residue that looks black (Figure 6A, B). The calcite fossils are white. Where the Jeffersonville Limestone is deep underground, it was a petroleum producer in the past. Even now, corals and sponges encountered when blasting in quarries or construction projects may weep oil.

This is a true patch reef. Large individual corals are scattered across the sea floor. Between them are smaller colonial or solitary corals and other organisms. Fish remains are not found in the coral zone but are found as teeth scales and the odd bone in the upper layers. Observations of fossil fish at the fossils are invariably fish-shaped invertebrates like this branching coral draped over by a stromatoporoid (Figure 7).

Above the coral zone is the *Amphipora ramosa* zone, named for a tubular stromatoporoid resembling a thin branching coral. It is very difficult to observe except on cleaned fossil beds below the Interpretive Center. This zone contains fossils like the upper coral zone. Large, well-preserved branching coral colonies indicate deeper water.

The highest limestone ledges below the Interpretive Center are the *Brevispirifer* zone and Bryozoan-Brachiopod zone, named for the most abundant fossils. These ecosystems were more like longshore deposits where the water was moderately shallow, but currents were swift enough to mix skeletal remains of invertebrates that lived and died at the time.

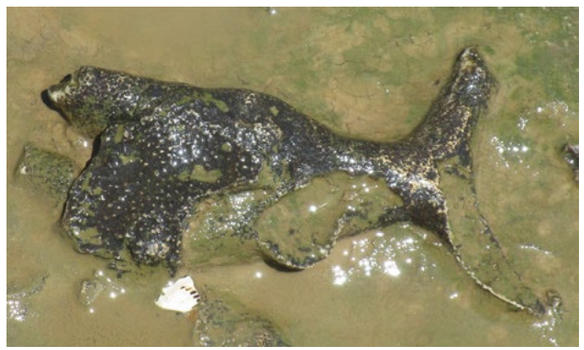


Figure 7: Branching coral draped over by a stromatoporoid sponge resembles a fish.

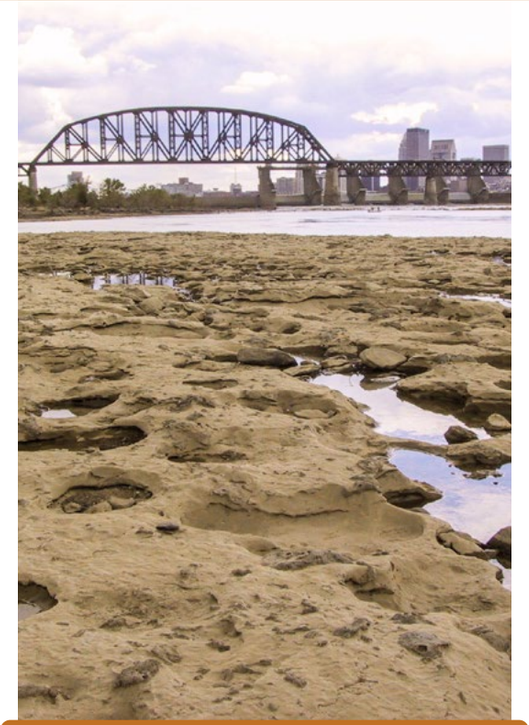
Figure 8. *Brevispirifer gregarius* brachiopods. Look for small horn, branching and honeycomb coral as well as casts/molds of clams and large snails.

In the case of the *Brevispirifer* zone, the strata has one species, *Brevispirifer gregarius*, whose shell occurs by the millions. This zone also contains abundant horn corals, "kneecap" corals (a type of *Favosites* or honeycomb coral) and the giant gastropod *Turbinopsis shumardi*. It also contains evidence of islands with freshwater ponds. Billions of freshwater charophyte algae eggs/seeds (about 0.5 mm across) were washed into the sea and are found in these rock layers. Today, charophyte algae can be found in quarry ponds and other bodies of water where calcium is dissolved.

The bryozoan-brachiopod zone contains many species of these creatures as well as crinoids and trilobites.

The fossil beds tell us an amazing story about life when we were 30 degrees south of the equator, in an environment like Florida Bay.

What is a patch reef?



Interpreting the origin of the fossil beds at the Falls of the Ohio

DNR Indiana Department of Natural Resources
Memories made naturally. INDIANA STATE PARKS
FALLS OF THE OHIO

The fossil beds at the Falls of the Ohio State Park (figure 1) are often said to be a fossil coral reef. Is this true? Let's look at what a reef is to answer that question.

A reef is a barrier to marine navigation. It can be an outcrop of stone, but a coral reef is more specific – consisting of coral colonies (see figure 2) exclusively in a warm, marine environment. Each colony consists of thousands to millions of soft polyp animals, depending on the species and age.

There are many different types of reefs. They might not be made of coral at all. Fossil deposits show in the past some reefs were made from echinoderms (like crinoids), clams, sponges, brachiopods, and other skeleton-producing animals.

The most well-known type of reef is a barrier reef. They can be enormous and have millions of coral colonies. They form parallel to coast lines. Australia's Great Barrier Reef is more than 2,000 miles (3,200 km) long. Other types include atolls, apron reefs and patch reefs. Atolls fringe submerged volcanoes. Apron reefs form on shallow undersea slopes, away from land masses. A patch reef (also called a bioherm) forms mounds of isolated coral colonies (see figure 3).

The coral bed at the Falls of the Ohio is part of an ancient patch reef that stretched some 1,000 miles (1,600 km) in length. It was probably hundreds of miles wide (see figure 4) and parts of it can be found in and in southwestern Illinois, Columbus, Ohio, near Buffalo, New York, in southern Ontario.

Within the park's Interpretive Center exhibit, "The Ancient Sea", there are two aspects designed to "immerse" you in a Devonian Sea that existed approximately 390 million years ago. First, you can walk through a reconstruction of a living Devonian sea floor (with water sound effects) and observe the diversity of sea life. One wall projects a moving "live" Devonian sea using CGI from a projected video. You can observe trilobites scuttling about, snails crawling, as well as fish and cephalopods swimming. The video represents a composite of several ecosystems preserved in the Devonian rock layers. Scientists estimate only one percent of plants and animals species are preserved as fossils.

Tropical reef environments have always shared similar characteristics, including warm water, high angle of solar radiation, and similar meteorological conditions. Coral reefs are found between 27 degrees north and south of the equator (roughly between the Tropic of Cancer and the Tropic of Capricorn). Coral does not grow well in cool water and therefore does not form reefs outside of the tropics. Fossil evidence indicates this has been true throughout geological history.

The Ancient Sea – Revealed

The Jeffersonville Limestone is separated into layers dominated by certain types of fossils. The lowest rock layer (stratum) is the coral zone, two different ecosystems dominated by corals. Only apparent to a few experts, the lower coral zone makes up the lowest Devonian limestone at the Falls of the Ohio. It is about two-feet thick and rests on an unconformity – a time gap – above the Silurian-age Louisville Limestone. This gap is roughly 30 million years. This part of the coral zone was deposited at the end of the Early Devonian (called the Emsian stage). Fossils include larger corals and sponges and smaller brachiopods, trilobites, crinoids, and other invertebrates. The largest corals are the best preserved in these faunal zones. The sea was deep enough that hurricanes and tropical storms toppled tall corals and sponges but didn't shatter them. As a result, three-dimensional fossils can be seen when the Ohio River is at its lowest, usually in autumn.

The largest horn coral is called *Siphonophren-*

Figure 5: 4-foot long horn coral. Note broom for scale.

Figure 2: Great Barrier Reef in Australia. Photo courtesy Dominque Hansen, PhD

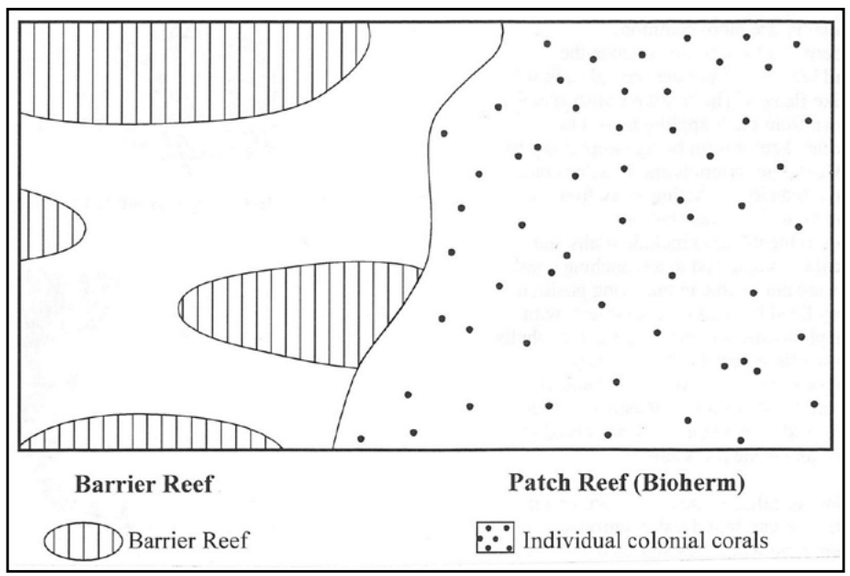


Figure 3

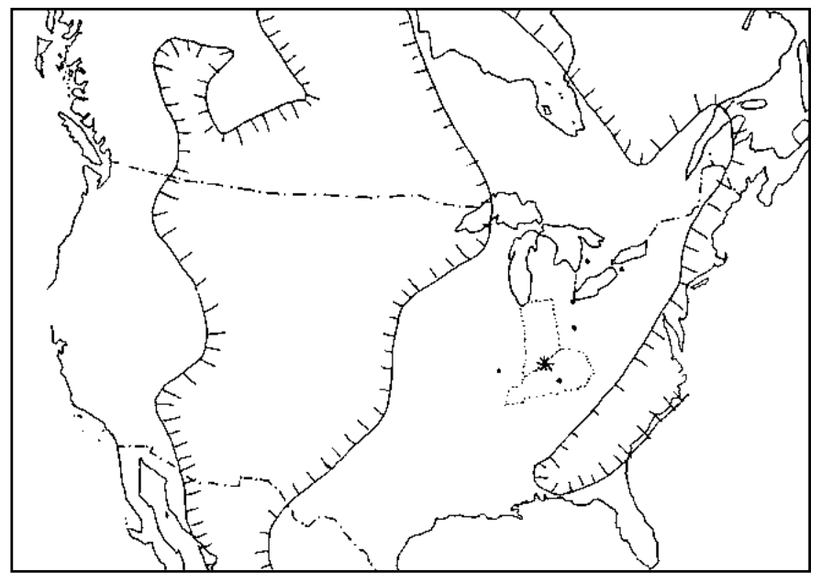


Figure 4: Dots mark Devonian coral-bearing exposures. The asterick marks the Falls of the Ohio.