

UNIVERSITY OF MINNESOTA  
**Minnesota at a Glance**



**Fossil Collecting in the Twin Cities Area**

**Geologic Setting**

The Twin Cities is a major urban area hundreds of miles from the nearest ocean. It is, nevertheless, an excellent place to collect seashells. This is because the area was submerged by continental seas millions of years ago, and was inhabited by marine animals whose fossil shells remain in the bedrock of this area. This guide will help you find, identify, and understand some of these fossils. Keep in mind, this is meant to be only a brief overview of fossils in Minnesota. More complete fossil guides are available (see below).

Fossils are the remains of organisms buried and preserved in sediments. They consist not only of hard body parts, such as bone and shell, but also may be tracks, trails, and burrows.

Some of the best places to collect fossils around the Twin Cities are in Ramsey, Dakota, and Goodhue Counties. Most rocks in this region formed from sediments deposited in seas that covered the area about 505 to 438 million years ago in what is known as the Ordovician Period.

During Ordovician time, Minnesota was located from 10° to 40° south of the equator; consequently, the climate here was tropical. The shallow sea which covered Minnesota and the adjoining region contained a variety of marine organisms including corals, bryozoans, brachiopods, clams, snails, cephalopods, and trilobites (see plate). Many of these types of organisms can be found in modern oceans, and some, like corals, are quite abundant. In some groups, however, the individual species, which lived in Ordovician time, are now extinct or rare. Other groups, like trilobites, are extinct altogether.

Rocks which have not been greatly disturbed or deformed are arranged with the oldest rocks at the bottom and the youngest rocks at the top. This is the case with rocks in the Twin Cities. Good exposures of rocks can be seen in a number of places along the Mississippi River in the Twin Cities area including the old Twin City brick yard at Lilydale Regional Park. There, the outcrop exposes a large part of the regional marine sequence from the St. Peter Sandstone at the bottom to the basal part of the Galena Group at the top (Fig. 1). Some of the uppermost units (most of the Galena Group, the Dubuque Formation, and the Maquoketa Formation), which are found in southeastern Minnesota, are absent in the Twin Cities because they have been eroded away.

The Decorah Shale is the best formation in southeastern Minnesota for beginners to collect fossils. In the quiet-water environment in which the sediments were deposited, life was abundant. This type of environment was also good for preserving the fossils, many of which can be found whole. The

Decorah Shale can be found in natural exposures like river banks and eroded hillslopes. The best sites to collect fossils, however, include manmade excavations like roadcuts and rock quarries. At these locations, the hard fossils are washed out of the softer shale by rain and runoff water and are commonly found loose on the face of the outcrop.

The St. Peter Sandstone is a nearshore deposit which contains very few fossils. The high-energy shoreline environment in which it was deposited was far from ideal for preserving fragile shells. The St. Peter Sandstone does contain fossils of a few sturdy snail and clam shells, but since these fossils are so uncommon and the sandstone is so soft, they are neither easy to find, nor to collect intact.

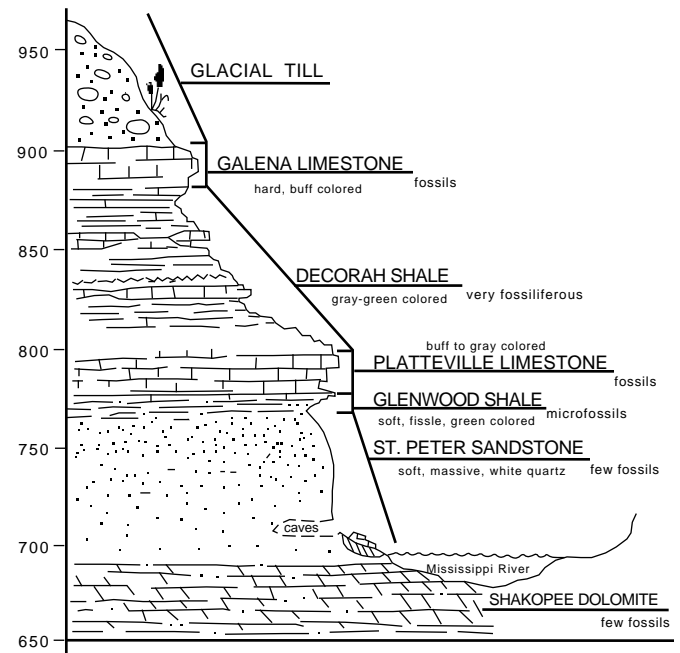


Figure 1. Cross section at Lilydale Regional Park (adapted from Ryan, 1990).

The Glenwood Shale contains few fossils. Most are the remains of tiny organisms called "microfossils."

The limestones of the Platteville Formation and the Galena Group were deposited in clear water under quiet conditions, and consequently both contain abundant fossils. They are difficult to extract from the rock, but can be found on bedding planes where the rock can be pried apart.

## Types of Fossils

(Refer to Plate for illustrations. Unless otherwise noted, illustrations are about the size of the fossils you might find.)

### Trace Fossils

Trace fossils are not the body remains of an animal. Instead, they are traces, or impressions, made when an animal burrowed, rested, or crawled upon the seafloor. The example illustrated probably was a burrow made by a segmented worm or arthropod.

### Anthozoans (corals)

Corals commonly found in the Decorah Shale are called horn corals because their skeleton, which is preserved, looks like a tiny horn. Corals are simple animals that feed by capturing floating sea life with their tentacles. Most modern corals are colonial, which means that many animals live together in one skeleton. Ordovician horn corals were solitary (having only one animal per coral skeleton). While many types of corals are abundant in today's oceans, horn corals are extinct.

### Bryozoans

These fossils commonly resemble a twig, a ribbon, or a small fan with tiny pores. Others are biscuit or gumdrop shaped or encrust other fossils. Like corals, bryozoans live by filtering food from surrounding water with special tentacles. Unlike the horn corals, bryozoans are colonial organisms; each pore in the skeleton is home to one tiny animal. They were abundant during the Ordovician Period, but they are scarce in modern seas.

### Brachiopods (lampshells)

Brachiopods are shelled organisms: their shell is composed of two unequal halves called valves. Commonly, fine growth lines and ribs are preserved on the fossil valves. Brachiopods usually attach themselves to the seafloor by a fleshy stalk which extends through one of the valves. They are filter feeders; however, their tentacles remain within their shell. Like bryozoans, they were abundant during the Ordovician Period, but are now quite rare.

### Pelecypods (clams)

Pelecypods, like brachiopods, are shelled creatures. Generally, their two valves are the same size and are mirror images of each other. Pelecypods are filter feeders that can move around by means of a fleshy foot. Commonly, the form of the animal is preserved as a cast of the internal cavity between the two valves. The shells are usually not preserved, and fine growth lines and details are lost.

### Gastropods (snails)

Gastropods usually possess one tightly coiled shell. Some shells are coiled in a plane (like a garden hose), and some are coiled in a spiral (like a cone). Snails without shells are called slugs. Although some modern snails have lungs and

live on land, many others live under water. They are scavengers, finding food along the seafloor.

### Cephalopods

Cephalopods of today include octopuses, squid, and the only living representative with an outer shell, the pearly nautilus. The bodies of Ordovician cephalopods were like those of modern squid or octopuses, but the ancient cephalopods had no internal skeleton. Instead, they had an external shell which grew as a series of chambers, and the animal occupied only the last, largest chamber. Ancient cephalopods were able to jet themselves rapidly through the water like the modern octopuses and squid and, like them, captured their prey with their tentacles.

### Trilobites

Trilobites are long-extinct relatives of modern arthropods such as crabs and lobsters. Like these modern relatives, they shed or molted their hard external skeleton as they grew. Many of the fragments of trilobites found in rocks may be molted segments. Most commonly, the fossilized fragments are from the head or tail of the animal. Trilobites fed along the sea bottom or burrowed for food. Trilobite fossils are typically the most sought after fossils, and the most difficult to find.

### Crinoids (sea lilies)

Crinoids, relatives of starfish and sea urchins, are spiny skinned animals with a five-fold body symmetry. The animal has a small cup-shaped body made of calcified plates (see Fig. 2). Five arms, each with many branchlets, extend from this cup. The crinoid attaches itself to the sea floor by a stem, and feeds itself by filtering food from surrounding water with its branchlets. The columnals which made up the stem are common fossils. The body plates are less common, but also may be found.

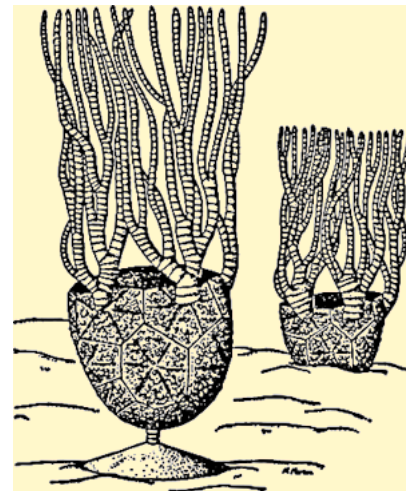
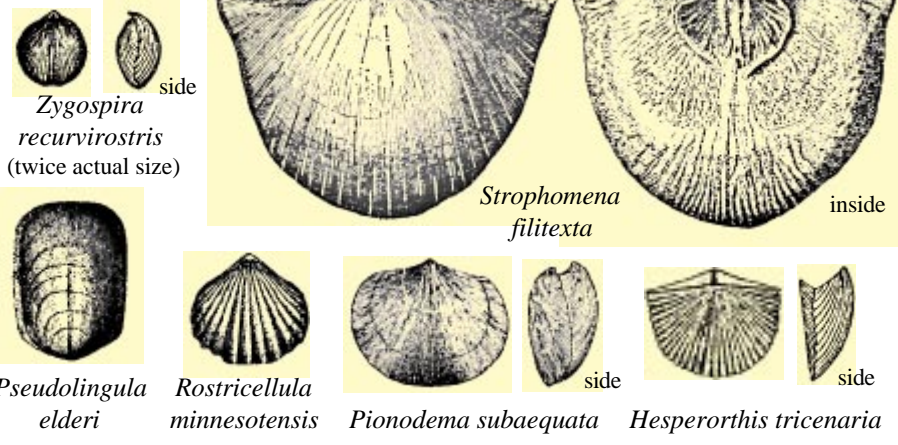


Figure 2. Restoration of the crinoid *Carabocrinus* sp. from the Decorah Shale (from Brower and Veinus, 1978).



**BRACHIOPODS**



*Zygospira recurvirostris*  
(twice actual size)

*Strophomena filitexta*  
inside

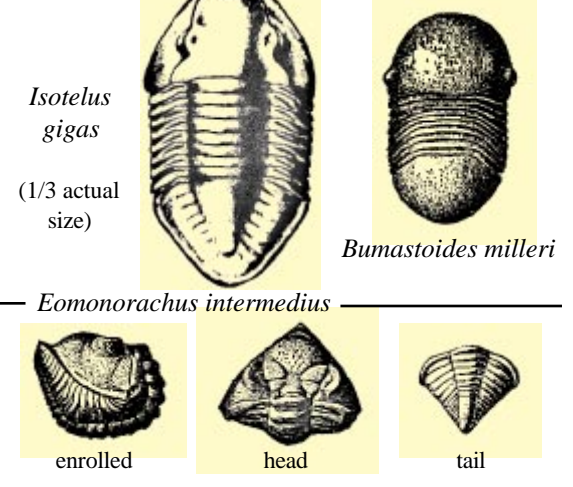
*Pseudolingula elderi*

*Rostricellula minnesotensis*

*Pionodema subaequata*

*Hesperorthis tricenaria*

**TRILOBITES**



*Isotelus gigas*  
(1/3 actual size)

*Bumastoides milleri*

*Eomonorachus intermedius*

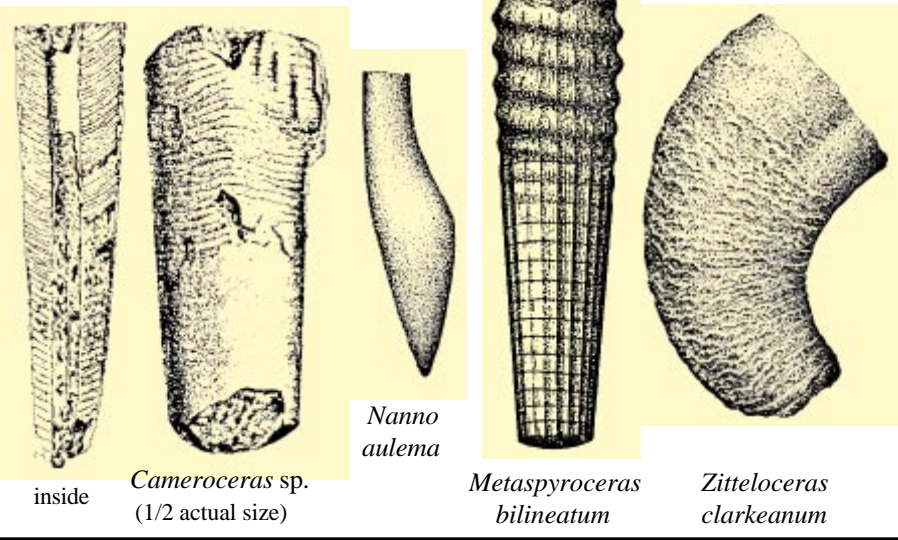
enrolled

head

tail

**Ordovician Fossils of Minnesota  
Twin Cities Area**

**CEPHALOPODS**



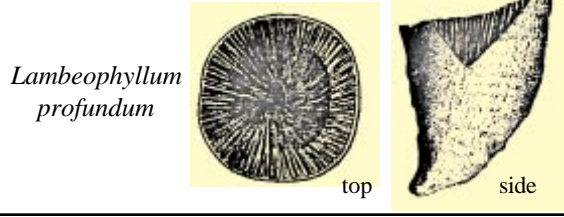
*Cameroceras* sp.  
(1/2 actual size)

*Nanno aulema*

*Metaspyroceras bilineatum*

*Zitteloceras clarkeanum*

**ANTHOZOANS**

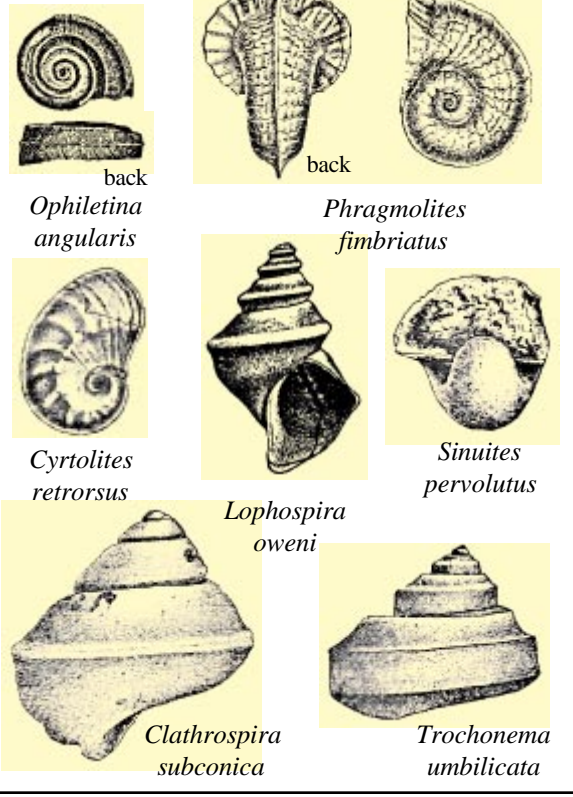


*Lambeophyllum profundum*

top

side

**GASTROPODS**



*Ophiletina angularis*

back

*Phragmolites fimbriatus*

back

*Cyrtolites retrorsus*

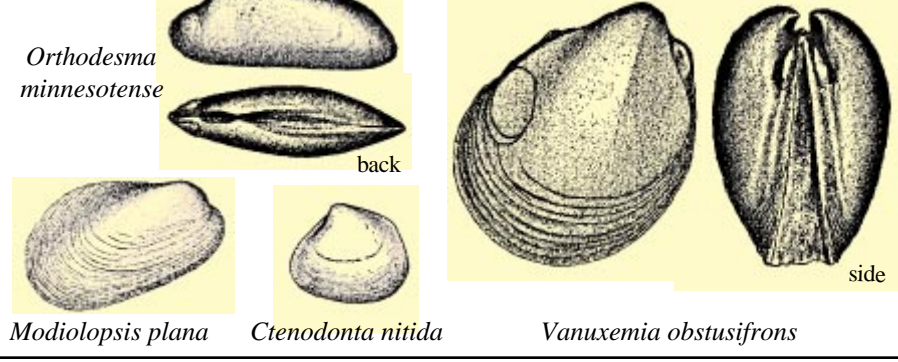
*Lophospira oweni*

*Sinuites pervolutus*

*Clathrospira subconica*

*Trochonema umbilicata*

**PELECYPODS**



*Orthodesma minnesotense*

back

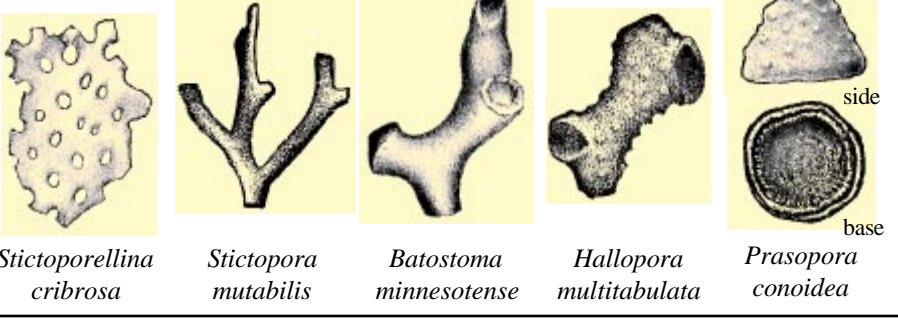
*Modiolopsis plana*

*Ctenodonta nitida*

*Vanuxemia obstusifrons*

side

**BRYOZOANS**



*Stictoporellina cribrosa*

*Stictopora mutabilis*

*Batostoma minnesotense*

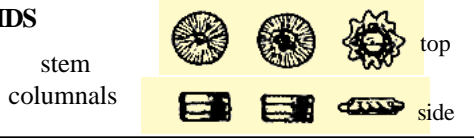
*Halloporella multitalulata*

*Prasopora conoidea*

side

base

**CRINOIDS**



stem columnals

top

side

**TRACE FOSSILS**



*Rauffella filosa* - a worm or arthropod burrow cast

## Fossil Collecting Sites

### In Dakota and Ramsey Counties:

1) Lilydale Regional Park. **Written permission is required.** St. Paul Division of Parks and Recreation (ph. 612-488-7291):

Take the Wabasha Street bridge south to Plato Avenue. Turn right (west) onto Plato Blvd. and continue to Water Street. Turn left on Water Street and continue to Joy Avenue. Turn left on Joy. The brick yard is at the end of the gravel road.

Here is the most complete section of Decorah Shale in Minnesota and some of the best fossil collecting. Fossils weather out of shale and are easy to collect. Abundant bryozoans and brachiopods, as well as other fossils, including trilobites, can be found.

### In Ramsey County:

1) Shadow Falls:

This site is in a St. Paul city park. From the monument overlooking the Mississippi River at the west end of Summit Avenue, St. Paul, trails lead north to a large ravine that is a good collecting site.

Rocks exposed are parts of the lower Decorah Shale and Platteville Formation down through St. Peter Sandstone. The upper part of the Platteville limestone here has a rich fauna consisting of clams, snails, trilobites, brachiopods, and horn corals. Fossils weathered out of the Decorah Shale can be found along trails above the limestone.

**In Goodhue County:** (Sites are next to the road in ditches or in roadcuts. A county map may help you to find these sites.)

1) Near Cannon Falls:

From Main Street, turn south onto 4th Street. Go 1/2 mile and turn east onto County Highway 25. Go 1-1/4 miles out of town. The ditch on the south side of the road (just north of turnoff to Valley View Way) contains fossils weathered from Decorah Shale including numerous bryozoa, brachiopods, and crinoid columnals.

2) South of Cannon Falls:

This site is a grassy roadcut in a hillside of Decorah Shale. The roadcut is on the west side of southbound U.S. Highway 52 about 4 miles south of the city limits. The best collecting is at the south end of the cut in a washout or gully. The author found crinoid plates here, in the Decorah Shale. Galena limestone, containing some brachiopods and Fisherites (green algae) is exposed uphill 1/4 mile farther south along southbound U.S. Highway 52.

3) Go east from Cannon Falls on State Highway 19 to County Highway 8. Go south about 1.75 miles on County Highway 8 to a small roadcut on the east side of road. The Decorah Shale is exposed here.

4) Near Wangs:

Large roadcuts on the east side of State Highway 56 from 1/3 to 1 mile north of Wangs expose the top of the Platteville

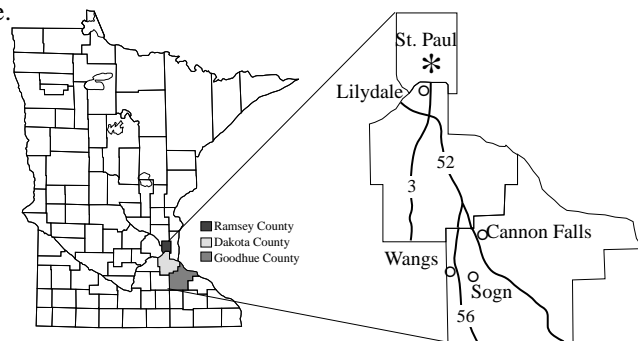
Formation, Decorah Shale, and the basal part of the Galena Group. This outcrop is very fossiliferous and contains abundant brachiopods and bryozoans.

5) South of Wangs:

A small roadcut 4.35 miles south on State Highway 56 exposes the top 10 feet of Decorah Shale and the basal 15 to 20 feet of Galena limestone.

6) From U.S. Highway 52, go east on County Highway 9 about 4 miles to County Highway 8. Go north on County Highway 8 approximately 0.2 mile to a roadcut just south of the bridge across a small stream. This is a large roadcut in basal Decorah Shale and the upper Platteville limestone. Collecting here is fairly good.

7) Follow County Highway 14 about 2.5 miles south of Sogn. Then go east 1.2 miles on County Highway 49. At the road junction, go north about 0.2 mile. Here, the grassy hillside consists of Decorah Shale and Galena limestone. Collecting is best at the north end of the hillside. The author notes that it was difficult to find many fossils the last time he visited the site.



### Additional Information:

Balaban, N.H., ed., 1987, Field trip guidebook for the Upper Mississippi Valley, Minnesota, Iowa, and Wisconsin: Minnesota Geological Survey Guidebook 15, 185 p.

Ojakangas, R.W., and Matsch, C.L., 1982, Minnesota's Geology: Minneapolis, University of Minnesota Press, 255 p.

Science Museum of Minnesota, 10th and Wabasha, St. Paul (ph. 612-221-9488). If you find an uncommon fossil, it may be of scientific value. Make careful notes of where you found it. The museum staff will identify it for you.

Sloan, R.E., ed., 1987, Middle and Late Ordovician lithostratigraphy and biostratigraphy of the Upper Mississippi Valley: Minnesota Geological Survey Report of Investigations 35, 232 p.

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