

Middle Devonian Transverse Group in Charlevoix and Emmet counties, Michigan

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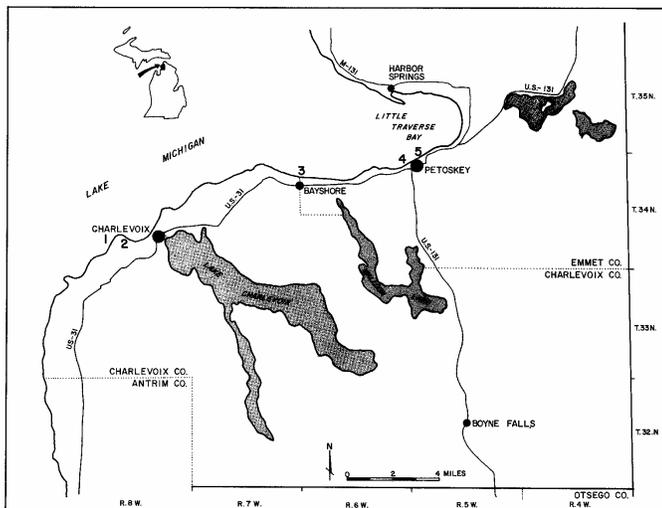


Figure 1. Map of the Little Traverse Bay region and described stops (indicated by numbers 1 through 5).

LOCATION

The Middle Devonian Traverse Group is a sequence of carbonates and shales randomly exposed as shoreline bluffs, roadcuts, river gorges, and quarries in the northern portion of Michigan's Southern Peninsula. Some of the most accessible of these outcrops are in Charlevoix and Emmet counties, where large sections of the group are exposed and are easily viewed by traveling U.S. 31 north along the Lake Michigan shoreline (Fig. 1). The route defined in this chapter can be followed on the Charlevoix, Bayshore, and Petoskey, Michigan 15-minute quadrangles. Most locations described are situated on public lands. Visitors are urged to obtain permission prior to entering sites on private property.

INTRODUCTION AND SIGNIFICANCE

The Traverse Group, exposed in the Little Traverse Bay region of Charlevoix and Emmet counties, presents excellent examples of carbonate and shale sequences resulting from multiple transgressions and regressions that swept a distal muddy sea-floor environment occupying the Michigan Basin during the Middle Devonian. The rate of basinal subsidence, carbonate accumulation, and supply of muds from a distant clastic wedge to the east controlled the rate of Traverse

deposition (Gardner, 1974). The Traverse Group is correlative with the Muscatatuck Group of Indiana (Shaver, 1974).

As exposed, the Devonian formations in Charlevoix and Emmet counties appear to be crimped around the Michigan Basin. Kesling and others (1974) state that the "crimps" (folds) observed in the outcrop areas are not confined to the basin periphery; subsurface data indicate the structures continue down-dip into the basin at a considerable distance. The observable folds are of various magnitudes, and many appear to be folds within folds. The major folds affect the strike of the beds up to 2 mi (3.2 km) in either limb, whereas the minor folds are on the order of a fraction of a mile. Kesling and others (1974) state that in some locations as many as nine reversals in dip occur within 1 mi (1.6 km). Figure 2 illustrates the major folds.

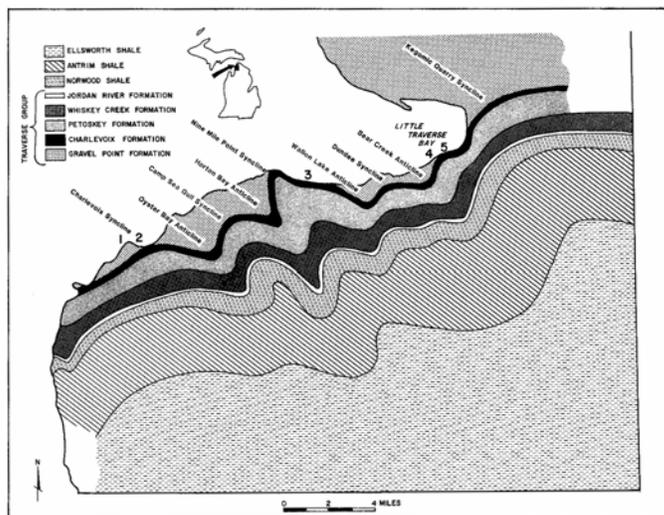


Figure 2. Generalized geologic map of the Little Traverse Bay region with major fold structures identified (modified from Kesling and others, 1974).

SITE DESCRIPTION

Traverse group

The Traverse Group, in the Little Traverse Bay region, consists of five formations, in ascending order: (1) the Gravel Point Formation, (2) the Charlevoix Limestone, (3) the Petoskey Formation, (4) the Whiskey Creek Formation, and (5) the Jordan River Formation (Fig. 3). The outcrops located along the shoreline, or just off U.S. 31, combine to provide excellent exposure of the Gravel Point, Charlevoix, and Petoskey stratigraphic units.

The Gravel Point Formation is a gray to brown, fine to cryptocrystalline, dense, lithographic limestone. The Gravel Point contains shale beds up to 2 ft (0.5 m) thick, as well as zones of chert nodules and petroliferous biohermal masses. The Charlevoix Limestone is a creamy gray to brown, fine to coarsely crystalline, slightly argillaceous, shaly limestone, commonly interbedded with coquina. The Petoskey Formation is a

pale buff to grayish brown, fine-grained, arenaceous limestone. The Petoskey Formation contains zones of porous, friable limestone with a strong petroliferous odor.

Recent workers (Runyan, 1976; Gardner, 1974; Kesling and others, 1974) have interpreted the Traverse Group in the Little Traverse Bay region as a product of a shallow, subsiding marine carbonate shelf, similar to the present Bahama Platform. This type of marine environment was conducive to the growth and eventual preservation of the wide variety of fauna now found in the Traverse Group. Notable fauna include trilobites, ostracods, pelecypods, hydrozoans, bryozoans, crinoids, brachiopods, and corals. Of particular interest is the colonial coral *Hexagonaria*, which occurs throughout the Traverse Group, but is most abundant in the Gravel Point Formation.

Hexagonaria percarinata (Fig. 4) is more commonly known as the "Petoskey Stone." The "Petoskey Stone" is the official stone of the state of Michigan.

Hexagonaria percarinata was known by many earlier American paleontologists as *Acervularia profunda* and *Cyathophyllum davidsoni*. In the recent past it was usually identified as *Prismatophyllum davidsoni*.

Hexagonaria percarinata existed in massive colonies some 350 m.y. ago. The animal lived anchored to the bottom in deep-water mud flats. Buried by bottom silts, the animals became petrified over geologic time. When the Michigan region was scoured by glaciers during the last ice age, the fossilized coral colonies were exposed and often eroded from their place of origin in the bedrock and redeposited. "Petoskey Stones" are common beach rubble along the shores of Lakes Michigan and Huron, and may also be found in gravel pits, road cuts, and as glacial erratics. While "Petoskey Stones" can be collected throughout Michigan's northern lower peninsula, the most prolific area of collecting is near the city of Petoskey in Emmet County.

In outcrop, *Hexagonaria percarinata* may appear in massive colonies, but when found along shorelines, "Petoskey Stones" usually range from pebble size to as big as bowling balls. The most commonly found specimens are about the size of a chicken egg.

The collecting of beach deposited "Petoskey Stones" is a favorite Michigan pastime and visitors are encouraged to search for these prehistoric treasures. Visitors are reminded to seek permission prior to entering private property and that the collecting of "Petoskey Stones" from colonies preserved in outcrop is not encouraged.

Inspection of a *Hexagonaria percarinata* shows the corallites are closely packed, prismatically shaped, often with six sides, and are separated by thin walls. The corallites have been replaced almost entirely by calcite; however, there may be some quartz. The corallites have broad, sloping sides and depressed centers. Radiating septa appear thin, with many tiny cross-bars. The longest septa often meet and intertwine in the center of the calyx. The underside of a colony is covered by dense, smooth, rippled or wrinkled layers. The individual

corallites in a specimen will range from a quarter to half an inch (6-13 mm) long and wide.

		A	B
UPPER DEVONIAN		ELLSWORTH SHALE	
		ANTRIM SHALE	NORWOOD SHALE OR ANTRIM SHALE
		NORWOOD SHALE	
		JORDAN RIVER FORMATION	
		SQUAW BAY LIMESTONE	
MIDDLE DEVONIAN TRAVERSE GROUP		WHISKEY CREEK FORMATION	THUNDER BAY LIMESTONE
		PETOSKEY FORMATION	POTTER FARM FORMATION
			NORWAY POINT FORMATION
		CHARLEVOIX LIMESTONE	FOUR MILE DAM FORMATION
		GRAVEL POINT FORMATION	ALPENA LIMESTONE
		KOEHLER LIMESTONE	NEWTON CREEK LIMESTONE
		GENSHAW FORMATION	GENSHAW FORMATION
		FERRON POINT FORMATION	FERRON POINT FORMATION
		ROCKPORT QUARRY LIMESTONE	ROCKPORT QUARRY LIMESTONE
		BELL SHALE	BELL SHALE
		ROGERS CITY LIMESTONE	ROGERS CITY LIMESTONE

Figure 3. Correlation chart for Middle and Upper Devonian rocks of the north part of the Southern Peninsula of Michigan. A, west side of outcrop area, Antrim, Charlevoix and Emmet counties. B, east side of outcrop area, Cheboygan, Presque Isle and Alpena counties (modified from Pojeta and Renjie, 1986).

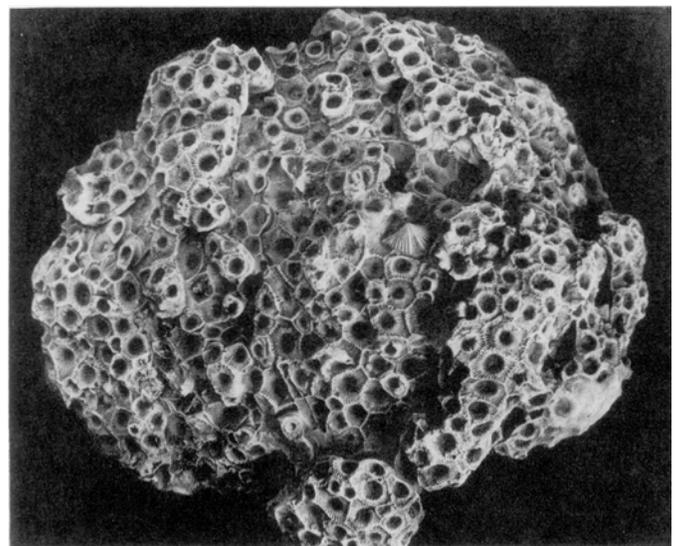


Figure 4. *Hexagonaria percarinata*, the "Petoskey Stone" (photo courtesy University of Michigan, Museum of Paleontology, specimen UMMP15645).

Stop 1

Stop 1 (Fig. 1) is located at South Point, 1.5 mi (2.5 km) west of the City of Charlevoix. This exposure is the type locality of the Gravel Point Formation. The best exposures appear in the ledges and bluffs along the Lake Michigan shoreline where the limestone is highly crinoidal and contains plentiful pyrite cubes. The exposure is nearly on line between Sec. 28 and 29 of Charlevoix Township (see Charlevoix 15-minute quadrangle). The exposure can be reached by traveling south from Charlevoix 2 mi (3.2 km) on U.S. 31 to Bell Bay Road. Turn right (north) and follow Bell Bay Road 2 mi (3.2 km). It is a short walk from the end of the road to the shore. An excellent description of this exposure is given by Kesling and others (1974) under locality number 34-8-28/29.

Stop 2

Stop 2 (Fig. 1) is located at the Medusa Cement Company Quarry at South Point, 1.5 mi (2.5 km) west of the city of Charlevoix. The exposure can be reached by following the same route as to Stop 1, or the visitor may follow Lake Shore Drive 1.5 mi (2.5 km) west from Charlevoix to the quarry. One of the more complete exposures of the Gravel Point Formation is visible at this locality. Complete descriptions of this exposure are given by Segall and Sorenson (1973) and Kesling and others (1974). The local syncline and anticline structure typical of the region can be observed on the quarry faces. Visitors to the quarry must gain permission and sign a waiver prior to entry.

Stop 3

Stop 3 (Fig. 1) is located about 0.5 mi (0.8 km) north of Bay Shore, Emmet County. The exposure is located in the abandoned Northern Lime Company Quarry and can be reached by traveling north from Charlevoix on U.S. 31 8 mi (13 km) to Bay Shore. Turn left on Townline Road and proceed about 0.5 mi (0.8 km) to the end of the road. The Charlevoix Limestone and Petoskey Formation are exposed at this locality. At present, only the Charlevoix beds are clearly exposed as slumping has obscured large portions of the Petoskey exposures. The Charlevoix is represented by a dense sublithographic facies containing stylolites. The Petoskey is represented by a massive, highly fossiliferous, crystalline limestone. A complete description of the exposure is given by Kesling and others (1974).

Stop 4

Stop 4 (Fig. 1) is located at the Dundee Cement Company Quarry, 2 mi (3.2 km) west of the city of Petoskey off U.S. 31. The greatest thickness of the Gravel Point, continuous from the lowest exposed unit to the top of the formation, is exposed in the quarry. Because of its completeness of exposure the unit has been exhaustively studied; complete descriptions can be found in Ehlers (1949), Segall and Sorensen (1973), and Kesling and others (1974). The beds of the Gravel Point are well exposed at this locality (Fig. 5). The quarry also exposes syncline/anticline structures, rare prehistoric sinkholes, divergent strata, and biohermal reefs. Visitors must obtain permission to enter the quarry.

Stop 5

Stop 5 (Fig. 1) is located at the abandoned Northern Lime Company Quarry, bordering Little Traverse Bay in the city of Petoskey. Both the Charlevoix Limestone and the type locality of the Petoskey Formation are exposed here. The exposure is north-east of the Waterfront Park and Softball Field. It can be reached from U.S. 31 by turning left (west) on West Lake Street, then right on Quaintance Street and passing south of the Softball Field. U.S. 31 traverses the rim of the old quarry.

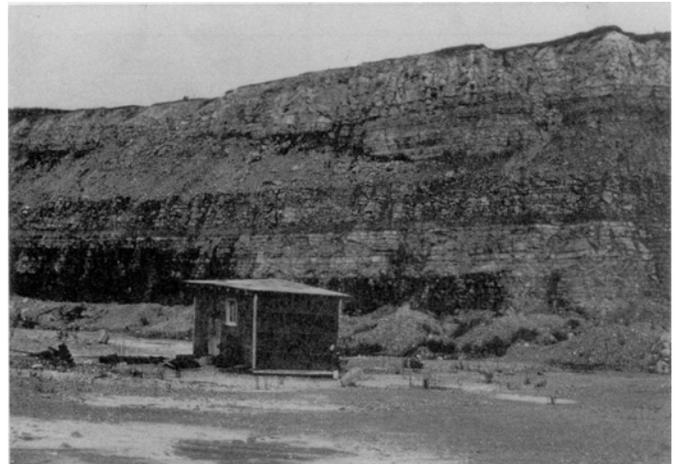


Figure 5. South wall, Dundee Cement Quarry, Petoskey, Michigan (photo courtesy Michigan Geological Survey).

Excellent exposures of both formations can also be found at Waterfront Park. Here an intriguing exposure of stromatoporoid reef can be seen, and the city has built a stairway that climbs up the side of the outcrop, greatly aiding the visitor. Again, complete descriptions of these sites can be found in Kesling and others (1974).

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