Clarence (Ozol, 1963; Oliver, 1966), is characterized by an anomalous abundance of chert. This member is not recognized east of Avon, New York and will receive no further attention in this paper.

Unless otherwise noted, the descriptions contained in this section are derived from Oliver's (1954, 1956a) work on the type localities of Onondaga members in the trip area. Representative thicknesses and spatial relationships of the members as seen in outcrop between Buffalo and the Helderbergs are schematically depicted in Figure 1.

Edgecliff Member

At its type locality, Split Rock (stop 2), the Edgecliff Member is a light-gray, very coarse-grained limestone. Beds range in thickness from 15 cm to in excess of 1.5 m. A basal section, 1 cm to 1.8 m thick, ranges from a quartz arenite to a sandy limestone. Quartz abundance rapidly decreases upward. Light-colored chert nodules are found throughout the member. The Edgecliff is characterized by an abundant fauna of rugose corals, tabulates, and large crinoid columnals. This fauna forms a coral biostrome throughout much of the state (Oliver, 1956b). Coral bioherms of the formation are restricted to this member.

Nedrow Member

In central New York, the Edgecliff Member is overlain by a 3-4.3 m unit of thin-bedded, very fine-grained argillaceous limestone, referred to as the Nedrow Member. The type section of this unit is Indian Reservation quarry (stop 1), just south of Nedrow, New York. Though chert is uncommon in the Nedrow, the upper beds locally contain some scattered medium- to dark-gray nodules.

The Nedrow may be recognized by its typical recessed weathering caused by numerous shaly beds within the matrix. In outcrop this feature makes the member easy to recognize; however, in a fresh cut (such as found in the Jamesville quarry, stop 3) it becomes difficult to differentiate between the Nedrow and Edgecliff strictly on lithologic criteria. For this reason, recognition of a Nedrow fauna is critical. The lower Nedrow bears a brachiopod-dominated fauna with several species of platyceratid gastropods and very few corals. Two characteristic coral species are Amplexiphyllum hamiltonae and a turbinate growth form a Heliophyllum halli. The upper Nedrow has a less diverse brachiopod fauna with only a few platyceratids.

Moorehouse Member

At its type locality in the Jamesville quarry (stop 3) the Moorehouse Member is a medium-gray, very fine-grained limestone with numerous shaly partings. This unit gradationally overlies the Nedrow Member, making their contact difficult to place. However, in the central New York region the top of the Nedrow is considered to be the uppermost shaly bed, usually separated by about 15 to 20 cm from the

underlying shaly bed. Dark-gray chert is common throughout the Moorehouse. Chert increases in abundance in the upper half of the member, where it commonly forms beds or anastomosing networks. The upper half of the Moorehouse is also less shaly and more fossiliferous than the lower half. The entire member in central New York is strongly dominated by brachiopods; nowhere are corals abundant.

Seneca Member

The type section of the Seneca Member is at Union Springs, New York. There the basal part of the member is a fine- to medium-grained limestone, which overlies a greenish-gray to ochre-colored clay layer 15 cm thick. This clay layer, the Tioga Bentonite, separates the base of the Seneca from the lithologically similar upper Moorehouse Member throughout much of the state. Approximately 3 m above the bentonite layer occurs a zone of "Chonetes" aff. lineata (= Zone J of Oliver, 1954). The Seneca is a "muddy" limestone, highly argillaceous, and poorly fossiliferous except for the "Chonetes" Zone. The Seneca grades upwards into the Marcellus Shale. The gradation is represented by a 2+ m section of increasing shale content within the limestone and by alternating beds of shale and lime.

Formational Contacts

Over its exposure area, the Onondaga overlies several older formations which generally increase in age westwards. In eastern New York, the Onondaga conformably and gradationally overlies the Schoharie Formation. Between Cobleskill and Richfield Springs the Onondaga overlies the Carlisle Center Formation. There the contact is marked by phosphorite nodules and glauconite grains, and represents a minor unconformity. Within the field-trip area, the Onondaga unconformably overlies one or the other of the Lower Devonian Oriskany, Coeymans, or Manlius Formations. Further west erosional remnants of the Lower Devonian Bois Blanc and the Silurian Akron Formations underlie the Onondaga.

The Onondaga Limestone is overlain by the Marcellus Shale. West of Cherry Valley the Marcellus Formation rests on the Seneca Member of the Onondaga Formation. In central New York, the contact is both interbedded and gradational. The limestone-shale contact is not exposed in western New York. However, it appears to be more abrupt than in the type area. East of Cherry Valley and north of Catskill, the Marcellus Formation rests on the Moorehouse Member of the Onondaga Formation. Their contact is abrupt, marking a minor unconformity which is either erosional (Chadwick, 1927) or nondepositional (Cooper, 1930; Flower, 1936). Oliver (1956a) tended to support the latter conclusion. Subsurface data indicates that the Seneca is the uppermost Onondaga member south of Catskill (L. V. Rickard, pers. comm., 1980).

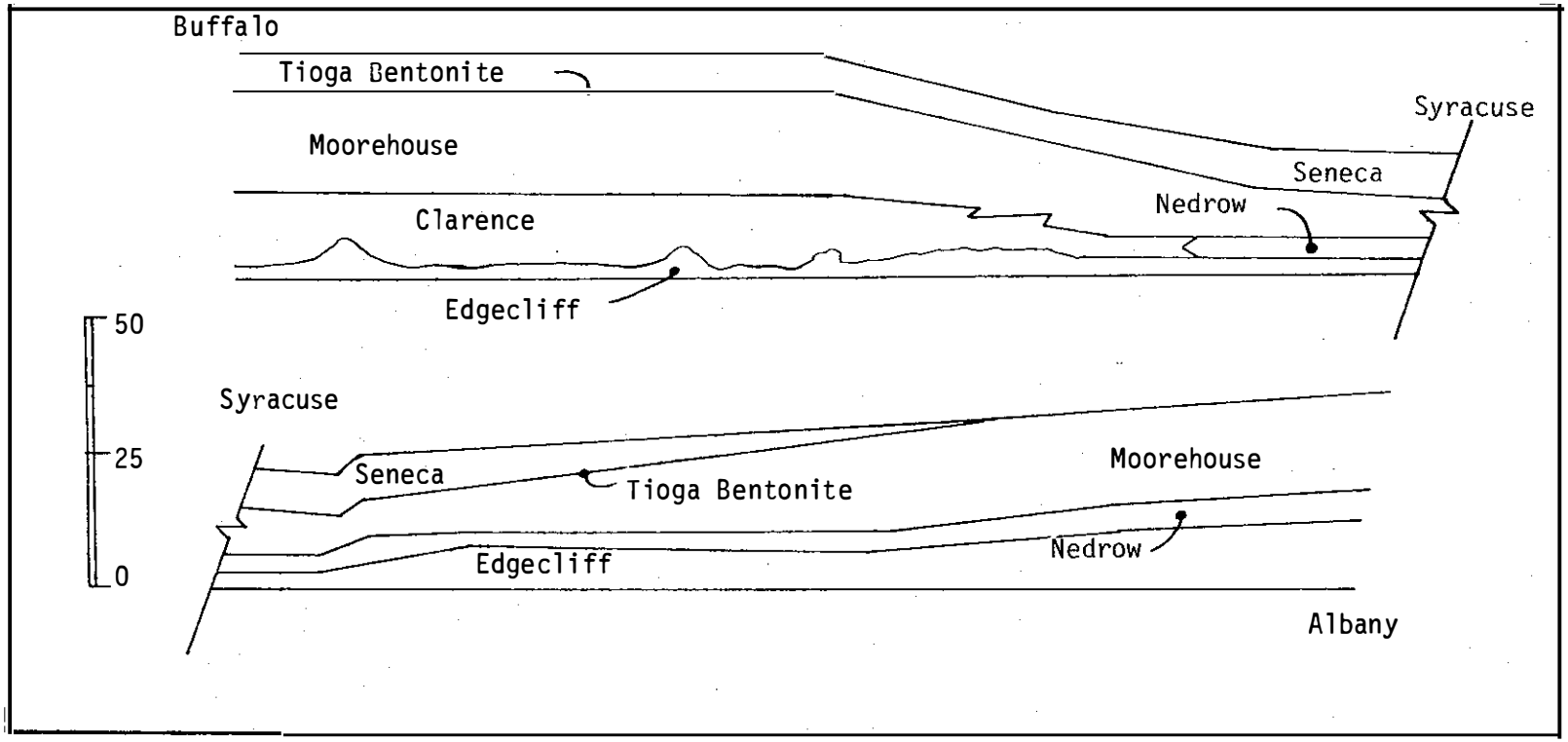


Figure 1. - Generalized cross section of the Onondaga Formation members as seen in outcrop between Buffalo and the Helderbergs, showing thicknesses and physical relationships. Adapted from Oliver (1954, 1956a). The scale is in meters.

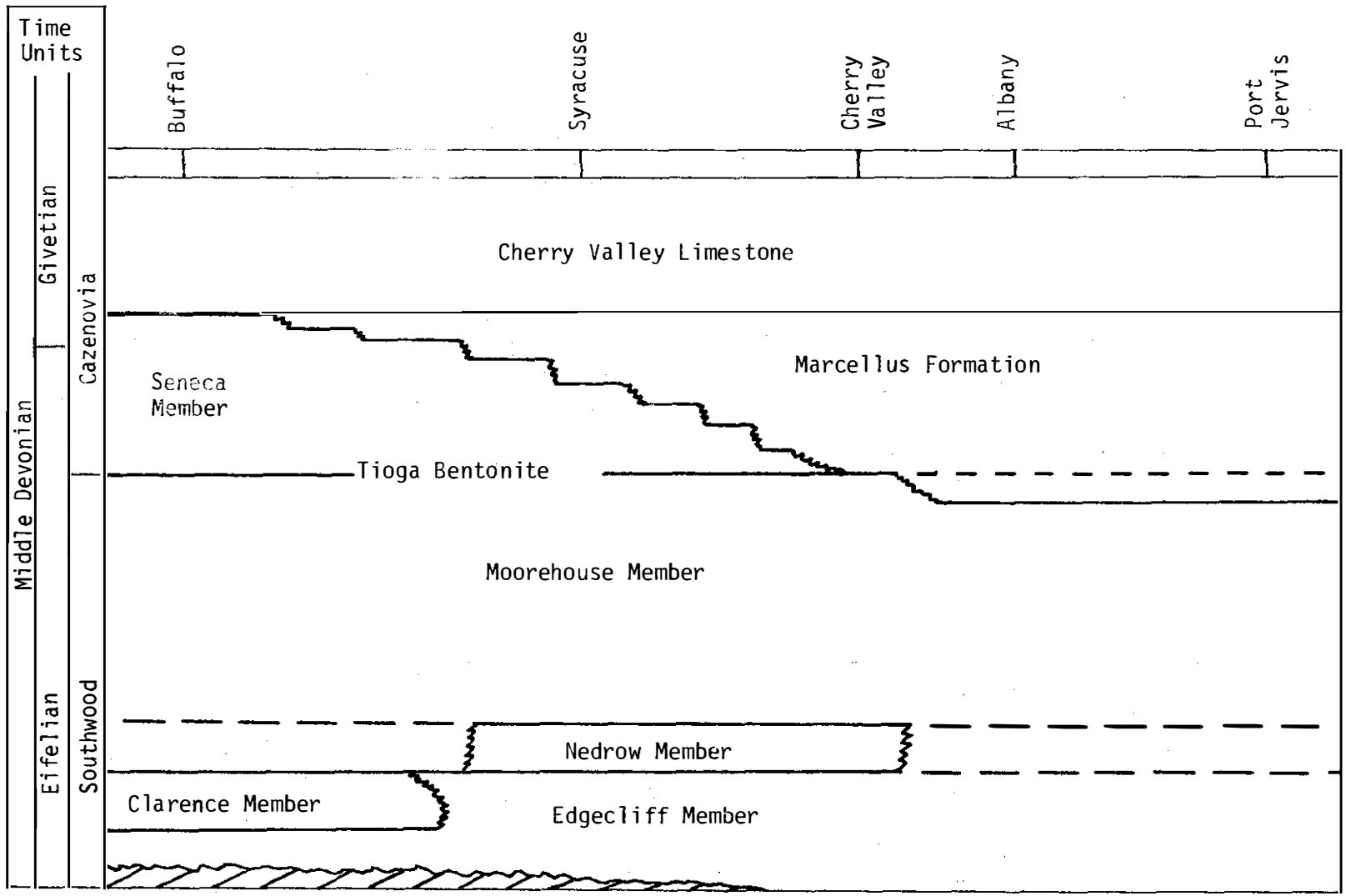


Figure 2. - Chronostratigraphic correlation of the Onondaga Formation throughout New York State. Horizontal dimension not to scale. Adapted from Oliver and others (1969) and Rickard (1975).

Age and Correlation

The Onondaga Limestone was deposited during early Middle Devonian time. Age determinations based on coral (Oliver, 1954, 1956a), cephalopod (Oliver, 1956c), and conodont (Klapper and others, 1971) faunas indicate that the Edgecliff, Nedrow, and Moorehouse members are of Southwood age (Rickard, 1975). The Seneca Member was deposited during Cazenovia time (Rickard, 1975). The formation is entirely correlative to the Eifelian of Europe. Intraformational chronostratigraphic relations are presented in Figure 2.

The basal Edgecliff Member marks the earliest record of the Middle Devonian throughout the state (Oliver, 1954, 1967). The Edgecliff is conformable with the Schoharie Formation in eastern New York and unconformable with the Bois Blanc Formation in the western area. Oliver (1967) concluded that the Bois Blanc and Schoharie Formations are age-equivalent, and that the base of the Onondaga is nearly, but not perfectly, isochronous.

The Tioga Bentonite, which is found at the Moorehouse-Seneca contact, delineates the end of Southwood (Onesquethaw) time (Oliver and others, 1967), placing the Seneca Member in the Cazenovian stage. Proceeding from west to east in outcrop, the Tioga and the top of the Seneca converge and become coincident just east of Cherry Valley. In eastern New York, outcrops north of Catskill, the Tioga presumably lies within the Marcellus Shale. In the subsurface of southeastern New York, the Tioga lies between the Moorehouse and Seneca members as it does in central New York outcrops (L. V. Rickard, pers. comm., 1980). Rickard has also found that in western New York the Tioga occupies three separate horizons, one of which is found at the Moorehouse-Seneca contact. Thus, the exact chronostratigraphic character of the uppermost Onondaga is not as straightforward as was previously thought. However, as seen in outcrop in the trip area, the top of the Onondaga is considered to be of early Cazenovia age (Rickard, 1975).

METHODS OF COMMUNITY ANALYSIS AND DESCRIPTIONS OF ONONDAGA PALEOCOMMUNITIES

In independent studies of Onondaga paleosynecology the authors generally applied Fager's (1963, p. 45) definition of paleocommunities as "recurrent organized systems of organisms with similar structures in terms of species presence and abundances". However, Feldman (1978, 1980) concentrated on the distributions of brachiopod genera while Lindemann (1980) stressed coral distributions and dealt with the remaining fauna bionomically or at high taxonomic levels. While these divergent approaches partly resulted from differences in research objectives and observational scales, both attempted to recognize and reconstruct the fossil equivalents of once-living communities of organisms. For this reason we feel that it is instructive to separately describe our analytic methods and the resultant communities.

Communities Recognized by Feldman

More than 50 localities within the outcrop belt of the Onondaga Limestone were studied, but only 30 were sampled in detail. Silicified outcrops were encountered mainly in southeastern New York, specifically in the mid-Hudson valley. Silicification was poor to nonexistent in the central region. The most productive outcrops were those which consisted of a large expanse of limestone in which single bedding planes were exposed laterally. In many cases, it was possible to identify the specimens in the field. However, if preparation of a specimen was necessary or if a particular specimen was needed for comparison and further study, it was often possible to crack out small slabs of limestone. This is especially true of the Nedrow Member. Collecting in the Jamesville quarry (stop 3) was relatively easy in this respect due to blasting and subsequent jointing. However, the fresh unweathered surfaces provided little in the way of good fossil material.

Nine brachiopod communities have been recognized in the Onondaga Limestone from Syracuse to southeastern New York (see Feldman, 1980, p. 31). Four of these, briefly discussed below, are found in the Syracuse area. The vertical distribution of these communities in the trip area is presented in Figure 3.

1) Leptaena-Megakozlowskiella community. This community is found in Nedrow-Moorehouse age rocks at the Onondaga Indian Reservation quarry (stop 1) in Nedrow, New York and the Jamesville quarry (stop 3). A mid-neritic environment of deposition is probable along with a moderately to highly argillaceous substratum. Leptaena and Megakozlowskiella are the dominant brachiopod genera (29.9 and 28.4 percent, respectively) of a total of 17 genera. Other taxa present include tabulate and rugose corals (common), gastropods (very rare), a cephalopod (Foordites, very rare), trilobites (rare), camerate crinoid columnals (rare), and bryozoan fragments (rare). The trophic nucleus of this community is one of low-level suspension feeders (Leptaena-Megakozlowskiella). Noticeably absent are the numerous platyceratid gastropods of the mid-Hudson valley.

Locality description: Onondaga Indian Reservation, Nedrow, New York (stop 1), southwest of the junction of Route 11 and Highway I-81. Almost the entire Onondaga Limestone is exposed at this locality. This is the type section of the Nedrow Member (Oliver, 1954). The Edgecliff Member is best observed on the quarry floow at the southwest end of the quarry. Large crinoid columnals and stems are visible. The Nedrow-Edgecliff contact is best seen at the south face of the quarry wall where interbedded shaly beds mark the Nedrow. The Moorehouse-Nedrow contact is at the topmost shaly bed. The Seneca-Moorehouse contact is represented by the Tioga Bentonite which forms a re-entrant on the face of the quarry wall. The top of the Seneca is eroded.

2) Pacificocoelia community. I have found evidence of this community at only one outcrop witnin the Nedrow Member. The limestone

Figure 3. - Biostratigraphy of the Onondaga Limestone in central New York showing distribution of Feldman's brachiopod communities

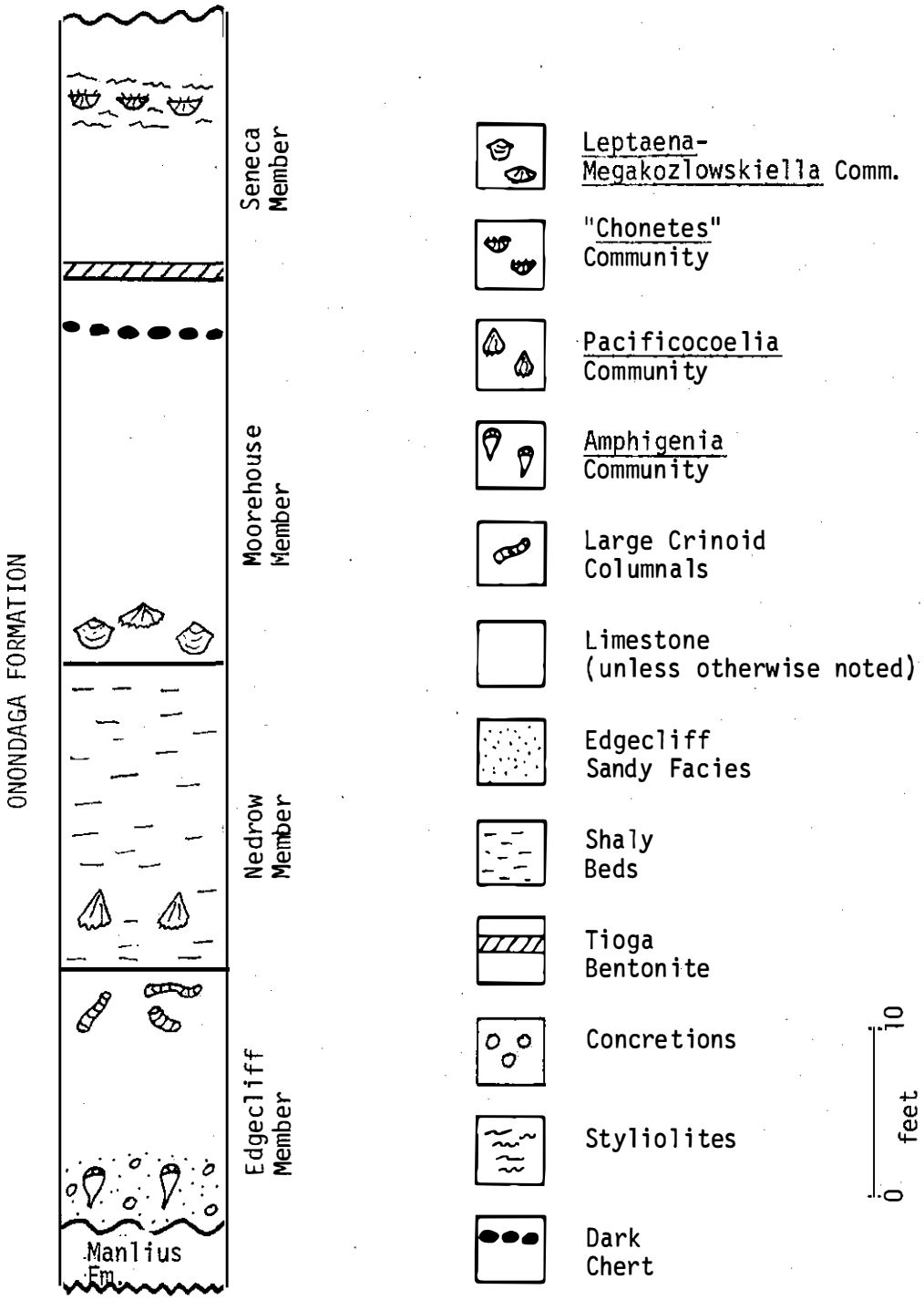
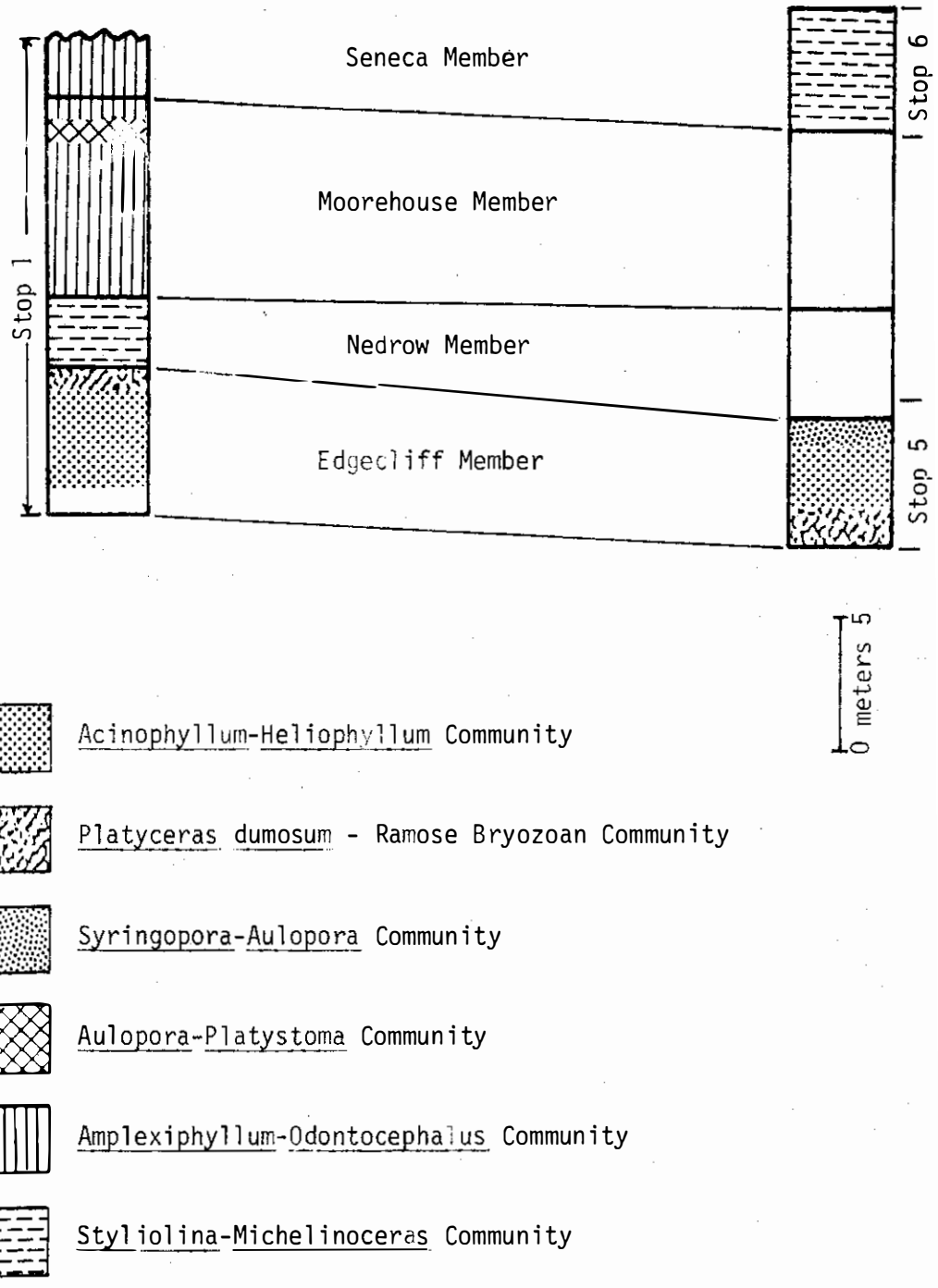


Figure 4. - Biostratigraphy of the Onondaga Limestone in central New York showing the distribution of Lindemann's communities.



is quite muddy and the brachiopods are packed on bedding planes which must be split with a chisel in order to extract them in quantity. A near-shore (inner-neritic) environment is postulated by virtue of the fact that the faunal composition of Johnson's (1974) acrospiriferid-leptocoelid biofacies (representing shallow water with abundant Acrospirifer, Howellella, and Pacificocoelia or Leptocoelina, with no Gypidula, Atrypa, and Schizophoria) is so similar to this Pacificocoelia community. Other brachiopod genera represented here are: Leptaena, Megakozlowskiella, orthotetacids, Dalejina, Pentamerella, Athyris, Megastrophia and Rhipodomella?. Pacificocoelia comprises 59.1 percent of brachiopod genera. Other taxa present include rare trilobite fragments.

Locality description: Most of the Nedrow Member is exposed along the southbound lanes of Highway I-81 about 0.5 miles north of exit 16, Nedrow, New York. The top of the Nedrow Member is missing. Also exposed is the Edgecliff Member including the basal sandy facies. The lower part of the Nedrow at this locality consists of about 1 m of medium-grained shaly limestone with alternating light and dark bands of gray to tan beds. Fossils are not common. The upper section consists of 2.1 m of medium- to fine-grained shaly limestone, tan to gray in color, medium- to thin-bedded. Chert nodules are commonly found within the bedding and locally weather out.

3) Amphigenia? community. This community is found in the basal sandy facies of the Edgecliff Member. This unit, similar to the sandy base of the Bois Blanc Formation, may represent one of three conditions: 1) reworked Oriskany Sandstone, 2) reworked "Springvale" Sandstone, or 3) unnamed sand of combined Oriskany and "Springvale" ages. The environment of depositon is considered inner-neritic. The only brachiopods found in this unit are specimens of Amphigenia? along with tabulate (Favosites?) and rugose (Acinophyllum, Heliophyllum, "Heterophrentis") corals. Preservation is fragmental and very poor.

Locality description: The Edgecliff Member, including the basal sandy facies, is exposed along Highway I-81, about 1.5 miles north of exit 16, along the southbound lanes, on the east side of the road. The lowermost unit consists of 30 cm of limy, coarse-grained friable sandstone, locally jointed. Nodules are locally present within the matrix. Above the basal unit is 1.2 m of sandy, brownish, coarse-grained, massive limestone gradational with the overlying unit. This unit is 3.2 m thick and consists of medium- to coarse-grained light-gray crystalline biostromal limestone with large amounts of crinoidal debris.

4) "Chonetes" community. This community is found only in the Seneca Member about 3 m above the Tioga Bentonite. The limestone contains a large amount of silt and is representative of outer-neritic conditions. The substratum was most likely a soft lime mud. "Chonetes" is the dominant brachiopod (99 percent) with a few specimens of Megakozlowskiella, Leptaena, Megastrophia, indet. orthotetacids, Athyris, Atrypa, and Pentamerella. Other taxa present include rugose corals, euomphalacean gastropods, trilobites, and crinoid columnals.

Locality description: This section is located in the Jamesville Quarry #3 pit. The quarry is actively mined and, therefore, there are few weathered surfaces. Collecting is often difficult. The Seneca here is a muddy, fine-grained, medium- to thick-bedded limestone with some chert nodules. The weathered surface is earth colored whereas a fresh surface is dark gray. Bedding planes are commonly wavy with numerous stylolites. A chert band 2.5 cm thick occurs at the top of the "Chonetes" zone.

Communities Recognized by Lindemann

Thirty-eight exposures within the outcrop belt of the Onondaga Limestone were selected for detailed measurement and study. At each site, faunal censes, hand specimens, and lithologic descriptions were obtained from single beds. Each sampled bed was divided into small quadrats and each quadrat meticulously examined with a large hand lens for detail and small specimens. Because of the nature of most exposures and the erosional characteristics of the formation, sampling was predominantly restricted to vertical sections of beds. As a result, the diversity of identifiable faunal elements was limited, and with the exception of corals, was usually restricted to high-level taxa.

A total of nine communities was identified in the Onondaga Formation in the area between Buffalo and Catskill. Six occur in the field trip area. The faunal compositions of these six are described below. Their stratigraphic distributions in central New York are shown in Figure 4.

1) Acinophyllum-Heliophyllum community. Corals dominate this community. With 25 genera constituting in excess of 50 percent of the fauna, they are nowhere more diverse or numerous. Acinophyllum and Heliophyllum are particularly abundant. Many genera such as the rugosans, Siphonophrentis and Cystiphylloides, as well as the massive tabulates, Emmonsia, Favosites, and Lecfedites, reach formation-wide abundance maxima. Cylindrophyllum and Pleurodictyum,which are usually restricted to Edgecliff reefs, are present. Stromatoporoids are also present. Camerate crinoid columnals measuring up to 2.5 cm in diameter and 15 cm in length attain extra-biohermal abundance maxima. The trilobite, Phacops, is present in small numbers as are the gastropods, Platyceras and Straparollus. Bryozoans are rare and never intact. Brachiopods are few in number.

Tubular vertical burrows dominate the ichnofauna. Three undulatory forms with diameters of 1 mm, 3 mm, and 7 mm, are present. The 3-mm form is most numerous. Conical vertical burrows 6 mm in length and 2 mm at the largest diameter are common. Cup-shaped epichnia 3 cm wide and 4 cm deep are present. Horizontal burrows and bioturbation are rare.

2) Platyceras dumosum-ramose bryozoan community. Bryozoans dominate this community. Ramose fistuliporid cyclostomes are abundant

and mostly restricted to this community. Fenestrate cryptostomes are also present, but far less common. Trepostomes are rare. Specimens of all bryozoan growth forms are preserved intact. Brachiopods are the second most abundant faunal group. Approximately 45 percent of the individuals remain articulated. The corals, which comprise less than 10 percent of the fauna, are represented by twelve genera. The rugosans and tabulates are respectively dominated by Heteophrentis and Coenites. Specimens of all coral genera occur intact and/or in presumed life position. Stromatoporoids and the lithistid sponge, Hindia, are present in small numbers. Trilobites are dominated by Phacops, with Odontocephalus also present. Cephalopods include rare specimens of orthoconic and gyroceraconic nautiloids. Gastropods, while not abundant with respect to the total fauna, are by no means few in number. Playtceras, Platystoma, and Pleurotomaria occur as juveniles and adults. Platyceras dumosum is common, ubiquitous, and essentially restricted to this community.

A well-developed ichnofauna is present. Two forms of horizontal burrows with diameters of 2 mm and 5 mm are present. The burrows occasionally convert to a curved concave-up orientation and terminate at bedding surfaces or prominent intra-bed laminations. These traces have been identified as forms of Chondrites by Adolf Seilacher (Lindholm, 1967, p. 66). Two additional horizontal burrows with diameters of 1 cm and 1.5 cm are also present. Three forms of straight, lined, mud-filled vertical burrows, having diameters of 4 mm, 1 cm, and 2 cm were also observed. The latter form terminates at upper bedding surfaces, and is a minimum of 15 cm in length. Undulatory vertical burrows occur in small numbers. These traces measure 2.5 mm in diameter and 4.5 cm in length. They invariably terminate in calcarenite-filled swales of irregular upper bedding surfaces. An epichnion measuring 3 cm wide and 4 cm deep is present. In plan view, these traces are discontinuous and cross one another at irregular intervals and angles.

3) Syringopora-Aulopora community. Dominance of this community is shared by brachiopods and corals. Approximately 40 percent of the brachiopods are articulated. Corals are represented by 11 genera. The tabulates, Syringopora and Aulopora, are the most numerous corals. The former attains its formational maximum abundance within this community. The rugosans are dominated by Heterophrentis and Heliophyllum. Coral preservation is excellent. Many specimens show no signs of post-mortem wear and some remain in presumed life position. Domal stromatoporoids of moderate dimensions are present. Gastropods, particularly Pleurotomaria, attain their maximum formational abundance. Numerous juveniles are present. Trilobites are represented by Phacops. Fenestrate bryozoans are few in number, but several specimens were found to have been preserved intact and nearly in life position.

Ichnofossils are abundant. Three common forms of Chondrites measure 2 mm, 5 mm, and 7 mm. Three forms of vertical burrows are present. The most common has a diameter of 2 mm and is lined. Another has an outer diameter of 1.5 cm, a lining 3.5 mm thick, and a living space of 8 mm in diameter. The third vertical trace is an "escape

burrow", 3.5 mm in diameter. It contains sediment in which fossil material is oriented in a concave-down chevron pattern. This fossil is known from a single specimen.

4) Aulopora-Platystoma community. Brachiopods dominate this community. However, they constitute less than half the total fauna. Juvenile specimens are common. Overall, 33 percent of the adult brachiopods are articulated. This percentage is somewhat higher for the genera Atrypa and Athyris. Ramose cyclostome bryozoans constitute a large percentage of the fauna. Their zoaria are occasionally preserved intact and semierect. One specimen was preserved with its holdfast in place, having simply fallen over prior to burial. Trilobites, represented by Phacops, are relatively common. Corals are dominated by the tabulate, Aulopora, and the solitary rugosan, Bethanyphyllum. Aulopora reaches its formational maximum abundance in this community. The gastropods, Platystoma and Platyceras, occur in small numbers as juvenile, and adult individuals. The lithistid sponge, Hindia, is also present, though rarely common.

The ichnofauna of this community is abundant and diverse. The most common trace is a form of Chondrites 2 mm in diameter. This fossil is commonly present and locally pervasive within the strata. Two additional forms of Chondrites, with diameters of 0.5 mm and 4 mm, are much less common. Vertical traces are restricted to a single form of straight, lined, mud-filled domichnia measuring 4 mm in diameter. A form of epichnia measuring 3 cm in width and 5 cm in depth is also present. In plan view, these traces are discontinuous, arcuate, and locally coincident.

5) Amplexiphyllum-Odontocephalus community. This community is dominated by the trilobites, Odontocephalus, Dechenella, and Phacops. Brachiopods are the second most abundant group of organisms. Corals comprise less than 4 percent of the fauna and are of low diversity. They are dominated by the small solitary rugosan, Amplexiphyllum hamiltoniae. Heterophrentis and the tabulate, Aulopora, are also present. Cephalopods are represented by local occurrences of the gyroceraconic nautiloid, Halloceras.

Numerous signs of bioturbation indicate that detritivores were an important component of this community. However, only two types of recognizable ichnofossils are present. The more common trace is a Chondrites with a diameter of 2-3 mm. The other recognizable trace consists of straight, discontinuous epichnia measuring 2 cm in width and 5-50 cm in length. They occur only at the upper surfaces of beds, are filled with coarse fossil debris, and show no preferred orientation.

6) Styliolina-Michelinoceras community. The macrofauna of this community is overwhelmingly dominated by brachiopods. Many are juveniles and retain delicate shell structures. Styliolina, best seen in thin section, is of maximal abundance. It constitutes up to 95 percent of the fossil material seen in thin section and is therefore the actual faunal

dominant. Trilobites are represented by Odontocephalus and Phacops. Rugose and tabulate corals are rare, of low diversity, and primarily consist of juvenile and/or stunted individuals. Gastropods, primarily Platystoma, are also rare. The orthoconic nautiloid, Michelinoceras, is present, as is the goniatite, Foordites.

Bioturbation is prevalent. However, recognizable ichnofossils are uncommon. A Chondrites measuring 2-3 mm in diameter is present. A vertical trace measuring 5 mm in diameter is also present, but uncommon. The most common tract fossil is an epichnial groove 4 cm in depth and 2 cm in width. Each epichnion occurs at the top of the host bed, extending downward as a flat-bottomed trough of fossiliferous sediment.

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ROAD LOG FOR PALEOCOMMUNITIES OF THE ONONDAGA LIMESTONE

CUMULATIVE MILEAGE	MILES FROM LAST POINT	ROUTE DESCRIPTION
0.0	0.0	Leave SUNY Binghamton campus and heat east on Route 434 to Interstate Route I81. Take IB1 north towards Syracuse. Log mileage begins at this point.
66	66	Leave Route I81 at Exit 16 and turn left onto U. S. Route 11 north.
66.7	0.7	Very shortly after passing beneath I81 turn left from Route 11 onto Quarry Road.
67	0.3	STOP 1. Park on the road shoulders and walk into the quarry which lies between Quarry Road and the interstate.

STOP 1. This is the Indian Reservation quarry described in connection with Feldman's Leptaena-Megakozlowskiella community.

67.3	0.3	Return to Route 11 and turn left (north) towards Nedrow.
70.1	2.8	Leave Route 11 turning left (west) onto Route 173.
75.2	5.1	Turn left onto Split Rock Road. The road sign may not be visible so watch for a black-on-white D.O.T. sign and a yellow-and-blue state historical marker.
75.9	0.7	STOP 2. Continue to the end of Split Rock Road and into the quarry entrance.

STOP 2. This is the type section of the Edgecliff Member which is named for Edgecliff Park, located just to the west. The member's full thickness of 2.3 m is exposed in the upper areas of the main quarry. Its erosional base is marked by the presence of phosphate nodules. In the southern quarry wall, 3 m of the Nedrow Member are exposed. The top of the Nedrow has been removed by erosion.

76.6	0.7	Upon leaving the quarry, return to Route 173 and turn right.
86.7	10.1	In Jamesville turn right (south) onto N.Y. Route 91.

87.5	0.8	STOP 3. Turn left into the broad flat quarried area adjacent to Route 91 and park. The Onondaga is exposed in the upper quarry. Walk up into it by way of the unpaved road which comes down to Route 91 just south of where you've parked.

STOP 3. A nearly complete section of the Onondaga is exposed in this quarry. Only the top of the Seneca is gone. Thicknesses of the members are given below. An excellent exposure of the "Springvale" can be found to the west of the large storage building seen from Route 91. Here the "Springvale" contains a sparse brachiopod-bryozoan fauna and phosphate nodules. The main quarry floor is in the Edgecliff Member which is best seen along the south wall; it is at your right as you enter. Most of the quarry wall consists of the Nedrow and Moorehouse Members. This is the type locality of the latter. Fracturing and jointing of the rock have made hand and foot holds insecure. Please avoid falling or dropping rocks (or yourself) on other trip participants. The Seneca Member can be closely observed above and to the east of the main quarry. You can get to it by walking around the quarry to the north.

Seneca Member	1.5 m
Moorehouse Member	7.0 m
Nedrow Member	4.4 m
Edgecliff Member	5.2 m
"Springvale"	1.5 m

88.3	0.8	Take Route 91 back to Route 173 and turn right (east) uphill toward the prison.
88.8	0.5	Turn right (south) onto Taylor Road.
89.6	0.8	STOP 4. Park along road shoulder.

STOP 4. East of Taylor Road in the clump of trees across from the first house on the left is exposed a small section of a reef in the Edgecliff Member. While exposure does not permit a three-dimensional study of the reef, the fauna which includes Cylindrophyllum, Acinophyllum, Emmonsia, and Favosites indicates that what we are seeing is part of the core facies.

90.4	0.8	Return to Route 173 and turn right.
95.8	5.4	STOP 5. Drive through Manlius on Route 173. Going up hill and out of town there will be what appears to be a wooded and scrubby area on the left (north) side of the road. This is sharply broken by the school athletic field. Turn left into the western corner of the field and park near the storage shed. Frog Pond quarry is the scrubby area west of the athletic field. You can get into the quarry by way of any of the foot paths which lead in that direction.

STOP 5. The full 5.8 m of the Edgecliff Member are exposed here as is the lower 1 m of the Nedrow. The base of the Edgecliff is exposed on the middle of the quarry face which overlooks the frog pond in the southwest corner of the quarry. Rock weathering and extensive exposure of bedding surfaces make sampling and fossil collection here excellent.

114.1	18.3	Continue east on Route 173. At Chittenango get onto Route 5 headed east.
126.7	12.6	At the intersection of Routes 5 and 46 turn right (south) onto Route 46 towards Munnsville.
135.2	8.5	Proceed through Stockbridge and Munnsville and bear right on Phillips Road.
135.4	0.2	Turn right onto Phillips Drive.
135.8	0.4	Turn right onto Stockbridge Falls Road.
137.3	1.5	STOP 6. Proceed uphill until you see black shale to the right and Oneida Creek to the left. Look for and park in the wide road shoulder to your left as the road leans right. Watch out for eastbound traffic!

STOP 6. While virtually all of the Onondaga can be pieced together in the creek bed downstream from here, we will observe only the Seneca Member, 3.7 m of which are present in the stream. If water levels and recent sediment transport have been kind, we will be able to see a rare exposure of the contact between the Onondaga and the Union Springs Shale. For those who are interested, the full thickness of the Cherry Valley Limestone, about 1 m, is exposed on the north side of the road. There is no need to scramble up the shale for it, just trace the bed along until you meet it near road level.

138.8	1.5	Take Stockbridge Falls Road downstream to Pratts Road and turn right.
143.8	5	Turn right from Pratts Road onto Route 20.
174.8	31	At Lafayette get onto I81 headed south and return to Binghamton.
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