

MICROBIALITES WITHIN THE EURYPTERID-BEARING BERTIE GROUP OF WESTERN
NEW YORK AND ONTARIO, CANADA.

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Figure 1. Large stromatolite mounds in upper beds of the Ellicott Creek Breccia, Fiddlers Green Formation, Bertie Group at the Ridgemount Quarry South (RQS), Niagara Peninsula, Ontario, Canada. The reefs (note 28 cm. rock hammer in upper middle of photo) are comprised of “topographic waterlime” and breccia.

The Bertie Group is well known throughout the world as the repository of a fantastic suite of relatively rare arthropods – the eurypterids, and specimens have found their way into museums worldwide. Eurypterid specimens have been collected by the thousands ever since their discovery in 1817, but some aspects of their occurrence have gone mostly unnoticed. Increasingly, in recent years, I have noticed more and more that many (if not most) occurrences are associated in one way or another with a variety of microbialite morphotypes.

The occurrence of the eurypterid-bearing waterlimes is part of a little-understood cyclic sequence (Cieurca, 1973 and later) and it is now obvious that the newly observed microbialites (stromatolites, thrombolites and algal mats) are inherently involved with this cyclicity. Researchers should find the Bertie Group ripe for study in what otherwise sometimes looks like a boring sequence of dull, relatively unfossiliferous rocks.

The Bertie Group, of course, probably inherited part of its depositional regime from the earlier Salina Basin where previously very thick redbeds (Vernon-Bloomsburg), dolostone and evaporites (Syracuse Fm.) and dolomitic and argillaceous beds (Camillus Fm.) were laid down. Judging from what we see in upstate New York, the outcrop belt follows a northern shoreline and some of the units within the Bertie Group even appear like strandline deposits (upper beds of some of the waterlime units).

Bertie Group

FORT HILL WATERLIME

Algal Mounds - Microbialites

The Fort Hill Waterlime (Wl.) occurs at the base of the Bertie Group and is overlain by the Oatka Formation, a shaly dolomitic sequence with no known fossils, but with relict evaporite structures, especially salt hoppers (as at Morganville and Akron Falls). See Cieurca, 1973, 2011 for further descriptions.

The Fort Hill has lower and upper parts – the lower is the eurypterid-bearing, straticulate waterlime with salt hoppers up to six inches in size. This waterlime can be considered a planar stromatolite. The upper unit is more massive, irregularly-bedded, finely crystalline dolostone, but little is known at present about the nature of the mounding observed. Only small ostracods and salt hoppers have been observed within the mounds. The distribution of the Fort Hill is from at least the type area (Fort Hill and Buttermilk Falls north of LeRoy) east to Phelps, New York. It is a marker bed for the region (See Cieurca, 1973).

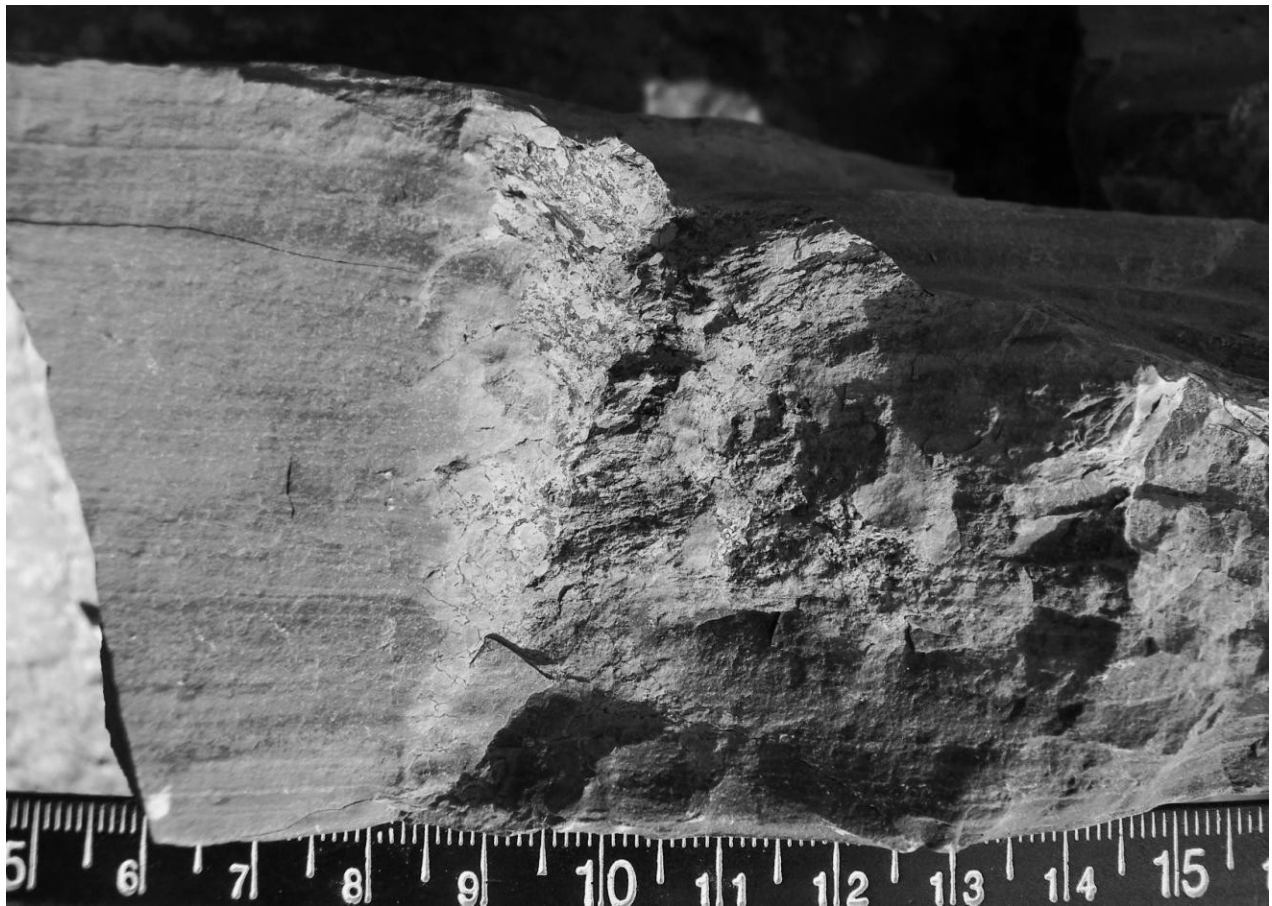


Figure 2. Lower Fort Hill Waterlime, finely straticulate (planar stromatolite) grading into disruptive halite pseudomorphs at right. This is the eurypterid bed (*Eurypterus* sp.) with ostracods and cephalopods.

Marking the base of the Bertie Group in western New York, the Fort Hill Wl., at the type section, is underlain by several meters of the Camillus Formation with mudcracked horizons and little or no fossils.

FIDDLERS GREEN FORMATION

Most of the microbialites observed within the Bertie Group are now recognized in nearly all of the Members and are of several types. The areal distribution is amazing as the microbialites occur, following the outcrop belt, over a distance of more than 300 miles. The most impressive structures are the great stromatolite mounds of the Ellicott Creek Breccia and the thrombolites of the Victor Member.

Morganville Waterlime (Member)

At the type section at Morganville, New York (Black Creek), the Morganville Waterlime is only 4 feet thick and simply a typical waterlime but with few fossils, mostly ostracods. However, it appears to thicken eastward and includes, possibly, a eurypterid fauna at Cayuga Junction on the east side of Cayuga Lake.

In 2012, I was able to view strata below the Victor Member at RQS in Canada for the first time in years as they were blasting the main mass of the Fiddlers Green Fm. away revealing the lower strata. I found the Morganville Waterlime again in what looked initially like the typical waterlime I expected, but with large circular mounds revealed at its top see below)



Figure 3. Circular stromatolitic mound, one of several, located on newly exposed quarry floor below the Victor Dolostone. The hammer is 27.5 cm. long. The floor is now flooded, but may become available in the future.

The mound was very resistant to sampling, but a chunk was finally released with a little prodding. The chunk from the mound revealed the stromatolitic nature of the mounds and is shown in the photo below - note the dark rind at top (the specimen, 120712, is in the PMNH).



Figure 4. The sample from the circular stromatolitic mound, fine-grained waterlime typical of the Morganville Member of the Fiddlers Green Fm.

Recent observations by the author with Carlton Brett and Matt Vrazo, reveal additional microbialite structures at Phelps, New York associated with the Victor 'A' Member.

Victor Member

In Canada, large thrombolites occur within the Victor Member (see photo, page 474 in Czurca, 1994) and microbialites of one form or another can be seen throughout the distribution of the member. At Phelps, New York, the Victor Member is distinctive with a limestone at its base (A), typical massive dolostone in the middle (B), and an upper limestone unit (C,D). Current research is revealing additional fascinating and large structures within this interval.

Much of the Victor Dolostone seems to consist more of algal mat material, irregular bedded strata with low amplitude stylolites and occasional eurypterid pieces preserved, especially within the more micritized beds as shown in the photo below. At Black Creek, Morganville, massive crystalline dolostone contains a eurypterid fauna early-recognized in Clarke and Ruedemann, 1911-1912. They recognized a peculiar kind of Eurypterus, now known as *E. laculatus* a form now known to be prolific within the Fiddlers Green Fm. across the state.



Figure 5. Relatively large pterygotid carapace (note large bulging eyes) from algal mat facies, Victor Dolostone, Manchester, New York.

Below the now famous eurypterid beds (Phelps Waterlime), in the roadcut opposite the Litchfield Town Hall, occur finely-crystalline, brown dolostone (Victor Dolostone) with much eurypterid material, black carbonaceous bedding planes (presumably of algal origin) and abundant ostracods, *Lingula*, trace fossils, *Eurypterus remipes*, and rarely pterygotid specimens are found here.

The Victor Member also forms the caprock of several waterfalls in western New York due to the extremely resistant nature of the 'reefy' phase of this dolostone. It is exceptionally evident along Murder Creek at Akron Falls (lower) at Akron, New York:



Figure 6. The caprock of the lower Akron Falls in June of 2012 when it was quite dry. The massive beds are Victor Dolostone (interpreted as constructed by microbialites) underlain by Morganville Waterlime.

The thrombolitic nature of the reef is shown in a closeup photo (Fig. xx). Following the outcrop belt, facies changes reveal microbial reefrock (enormous regional biostromes) grading into interreef beds and what appear to be shoals consisting primarily of the brachiopod, *Whitfieldella*. In the Marcellus Valley, crinkled stromatolitic beds with low amplitude stylolites and micritized *Whitfieldella* have been observed (Ciuca, 2011). At a few localities, waterlime with eurypterid remains appear to fill channels in the reefy facies. At other localities, the Victor Member exhibits more of an algal mat facies, perhaps indicating the more shallow portions (back reef) of sedimentation.

Salt hoppers occur in many of the beds, usually near the top of the succession as at Indian Falls. Hypersalinity seems to have played a strategic role in the development of many of the Bertie Group units and may have been necessary for the formation of some of the dolomitic units, especially the waterlimes. Salt hoppers are intimately associated with stromatolites and algal clasts and many eurypterid fragments and algal clasts appear to have been nuclei for the growth of halite crystals. It is obvious that all of the sediments that contributed to the formation of the Bertie Group were peculiar in one way or another. There is such variation in lithology, sedimentary structures, textures and preserved biota that make the group a fascinating subject for research – there is not only so much to learn, there is still so much to observe.



Figure 7. A closeup of the massive beds of Victor Dolostone at the lower Akron Falls. It takes a sledge hammer to examine the extremely resistant beds here. Stylolitic seams are common.

In the Niagara Peninsula (Ontario, Canada), the top of the Victor Member is overlain by the Black Shale Marker Bed (BSMB) which varies, within RQS itself, from ~0 to 6 inches in thickness. It is an anomaly within an otherwise carbonate depositional sequence.

Elsewhere, the Victor Member consistently shows evidence of microbial structures and/or bedded forms with only a slight change in faunal content. In easternmost localities, a lingulid brachiopod is commonly associated with abundant ostracods and trace fossils, but still with plenty of eurypterid remains. Over a broad expanse, the Fiddlers Green Fm. is a shallowing-up unit with most of the stromatolites in the upper beds when present (as in Canada).

Phelps Waterlime (Member)

One of the most important of the Silurian waterlimes of New York is the Phelps Member, only because it is so well known for the famous *Eurypterus remipes* Fauna, especially in the east (Passage Gulf and the Lang Quarry). In general, microbialites have not been too important within the unit, but a recent observation sheds much light on important facies changes within the unit. A very large collection of fossil remains and sedimentary structures from this unit is available for study at the Peabody Museum of Natural History.

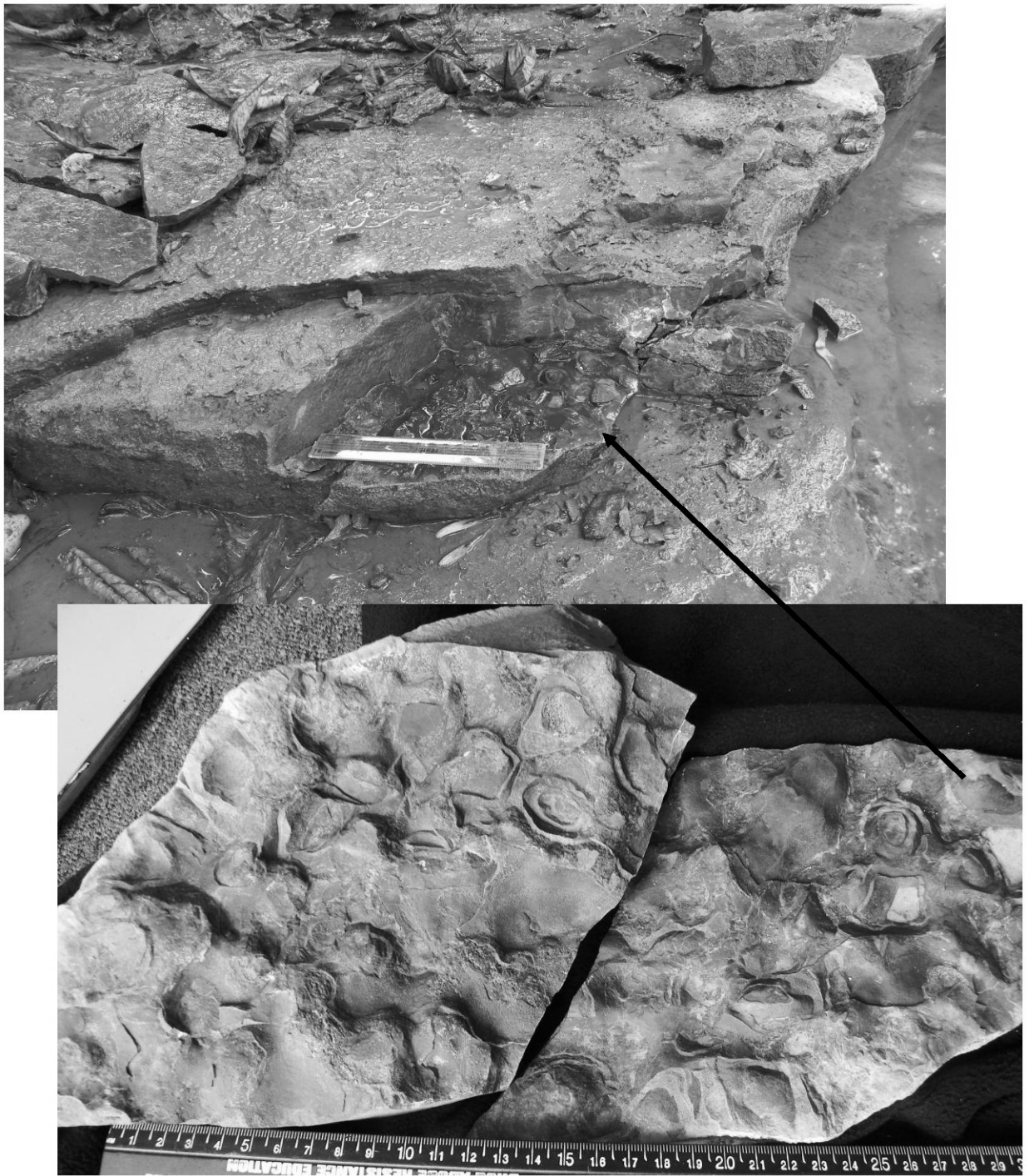
The Phelps Wl. has been traced from its type locality at Phelps, New York eastward to Passage Gulf (Millers Mills Quad.) where he collected hundreds of specimens from the *E. remipes* biota in a massive waterlime with mudcracks at the top. The Phelps is ~1 to 1.5 m. thick. Just a little westward, at a roadcut opposite the Litchfield Town Hall, he also collected (over many years) a large sample from the unit but found that the mudcracks were associated with layers of LLH stromatolites (Cieurca, 2005). This type of stromatolite was also observed at Mud Creek, East Victor, New York, but at most sections of the Fiddlers Green Fm. these are not evident.

Amazingly, within about a mile south of the type section of the Phelps Waterlime, at Flint Creek in the village of Phelps, essentially the entire Phelps Wl. is stromatolitic. This discovery provides for a different interpretation

of the distribution of this important eurypterid-bearing waterlime. The outcrop belt seems to follow a near-shore distribution of the waterlime with more off-shore facies (to the south) appearing now and then. The occurrence of the eurypterid fauna, in this case at least, is behind shallow-water biostromes of stromatolites (essentially back-reef). To the south, there were probably larger stromatolite/thrombolite complexes like those of the Victor Member grading perhaps even farther south into pure limestone facies.



Figure 8. Type section of the Phelps Waterlime, New York State Thruway north of Phelps. The massive beds in the uppermost part of the photo are the Phelps Member, Fiddlers Green Fm. Below this are limestones and dolostones of the Victor Member and lower strata – this is an exceptional exposure in this part of the state. This waterlime has yielded abundant eurypterid remains and associated fauna, most of the collection of which is now in the Peabody Museum of Natural History. Large salt hoppers, up to 6 inches on a side, have been found here and also abundant eurypterid remains with relict salt crystal impressions.



Figures 9 and 10. Phelps Member (stromatolite facies) at Flint Creek, Phelps, N.Y. Photos of outcrop of LLH stromatolites (laterally linked hemispheroidal) in creekbed and samples removed (080711-5). The Phelps here is overlain by very resistant beds of the Ellicott Creek Breccia. Rapid facies change occurs here -about one mile north, very little of the stromatolites are evident at the type section where the unit is simply eurypterid-bearing waterlime.

Ellicott Creek Breccia (Member) -ECB

ECB encompasses a variety of lithologies and textures including characteristic breccia, topographic waterlime, small and very large stromatolites, carbonaceous bedding planes and smooth interbeds of waterlime. Eurypterid remains (and other fossils) are common at certain sites (e.g. Niagara Peninsula, Ontario, Canada). In Canada, huge stromatolites cover some benches in a quarry (see Figure xx) documenting huge mounds that no longer exist as they have been converted to crushed stone.



Figure 11. ECB type section, Ellicott Creek, Williamsville, N.Y. The heron's rear end points to the reentrant at the base of the ECB. Below are upper beds of the Victor Member with prolific brachiopods (*Whitfieldella* sp.). Note: the heron had just caught a fish and that is why its head is down.

The arching beds in the figure are microbialite mounds in ECB-B, underlain by ECB-A. ECB-C is higher in the section and below the Scajaquada Fm. The lower, middle and upper beds of ECB can all become microbialitic depending on locality (facies changes can be rapid).

The reentrant is believed to be the BSMB (the Black Shale Marker Bed so prominent in Ontario, Canada). In general, ECB ranges from ~1.5 – 2.0 m. in thickness and is observed at numerous sites across western New York. At the Neid Road Quarry northeast of LeRoy, large mounds similar to those in Canada occur, but also smaller compact mounds (see page 91 in Nudds and Selden, 2008). A ramus from one of the largest pterygotids that ever lived was found associated with these mounds here.

At Flint Creek, Phelps, N.Y., ECB is prominent along a lengthy portion of the creek, above the Phelps Member but microbialites are not prominent. Brecciation is well-developed here and it has been suggested that the beds may represent a widespread paleoseismitic (<http://eurypterids.net/EurypteridMonth18.html>).

WILLIAMSVILLE WATERLIME 'A'

Algal Mounds - Microbialites

In recent years, a number of small mounds (1 foot plus) have been encountered within the Williamsville 'A' Waterlime at RQS, Niagara Peninsula, Ontario, Canada. The section of the quarry floor where the largest mound was observed is shown below. The stick in the photo is 0.5 m. Note the corrugated sides of the part exposed.



Figure 12. Large circular mound discovered within Williamsville 'A' – see text above.

Microbialites within the Williamsville Formation do not seem to be common and, indeed, none have been identified to date in the wonderful exposures of the unit eastward to the central New York region. It is the fortuitous situation at the RQS, where a bench was left in part of the quarry right at the contact of Williamsville 'A' with Williamsville 'B' (lower benches expose the top of the Fiddlers Green Formation and still lower, the base of the Fiddlers Green Fm.).

Microbialite (Thrombolite) Mats

Also recently observed were small areas that may represent thrombolitic mats, i.e. the structures are generally thin and matlike rather than mounds. Williamsville 'A' is generally 18 -24 inches thick in this quarry and is the repository of countless eurypterid (and other) remains and the observed mats also contain eurypterid parts.

The possible newly observed thrombolite mat occurs within a few centimeters of the top of Williamsville 'A' and parts of it were dismembered (samples collected) and are shown in photographs below. The size of the mat was around a meter, but its margins, where it contacts the general waterlime, were not seen. Besides the

europyterid carapace shown in the photo, another specimen showed a large phyllocarid spine on the underside of the mat.

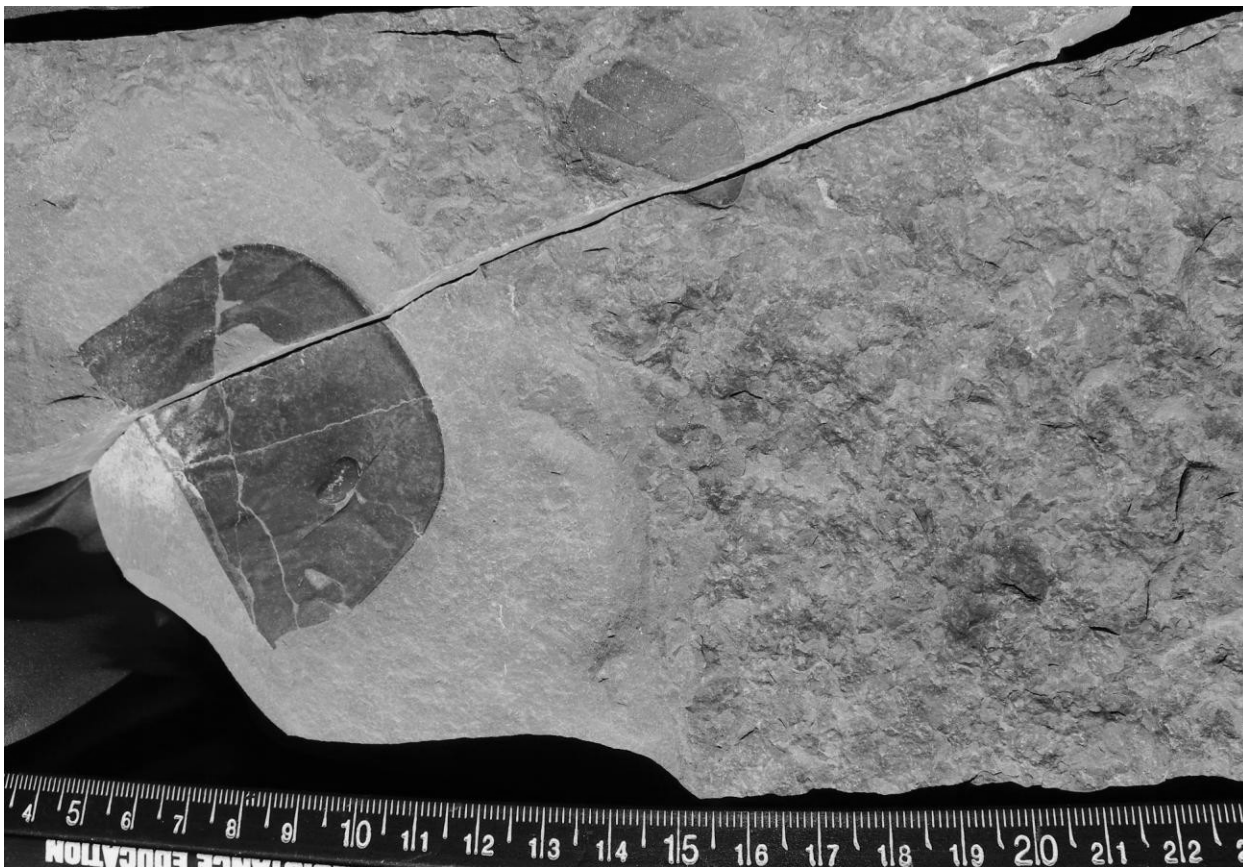


Figure 13 Slab of waterlime (underside) showing carapace of *Europteris lacustris* (dorsal down) with suggested thrombolite mat to the right (and with europyterid fragments on the mat).

Very few other examples of similar microbialite structures were observed in the Williamsville Formation during over 40 years of observations, but representative samples are to be repositied in the collections of the Peabody Museum of Natural History at New Haven, Connecticut.

‘Blotch’ Horizon

One of the more interesting discoveries at RQS was the “Blotch Horizon” just a few centimeters down from the ‘A – B’ contact (aka, A-B Event Horizon, Brachiopod Pavement). The horizon is just above the Trackway Horizon (see Cieurca, 2002) and consists of countless small, but complex structures resembling *Parka decipiens* and may represent an algal bloom that occurred only once during the deposition of the ‘A’ unit. They mostly seem to be randomly distributed on the bedding plane, but some may have been collected into windrows and depressions and many europyterid specimens have also been encountered on the same bedding plane.

Thus far, the only event horizons recognized in Williamsville ‘A’ are the two mentioned above (Blotch Horizon and the Trackway Horizon) and these occur within the upper third of the unit. None have been recognized below as it is difficult to dig much farther down into the 18 inch waterlime. It is known, however, that europyterid remains occur throughout lower layers, even just above the underlying Scajaquada Fm.

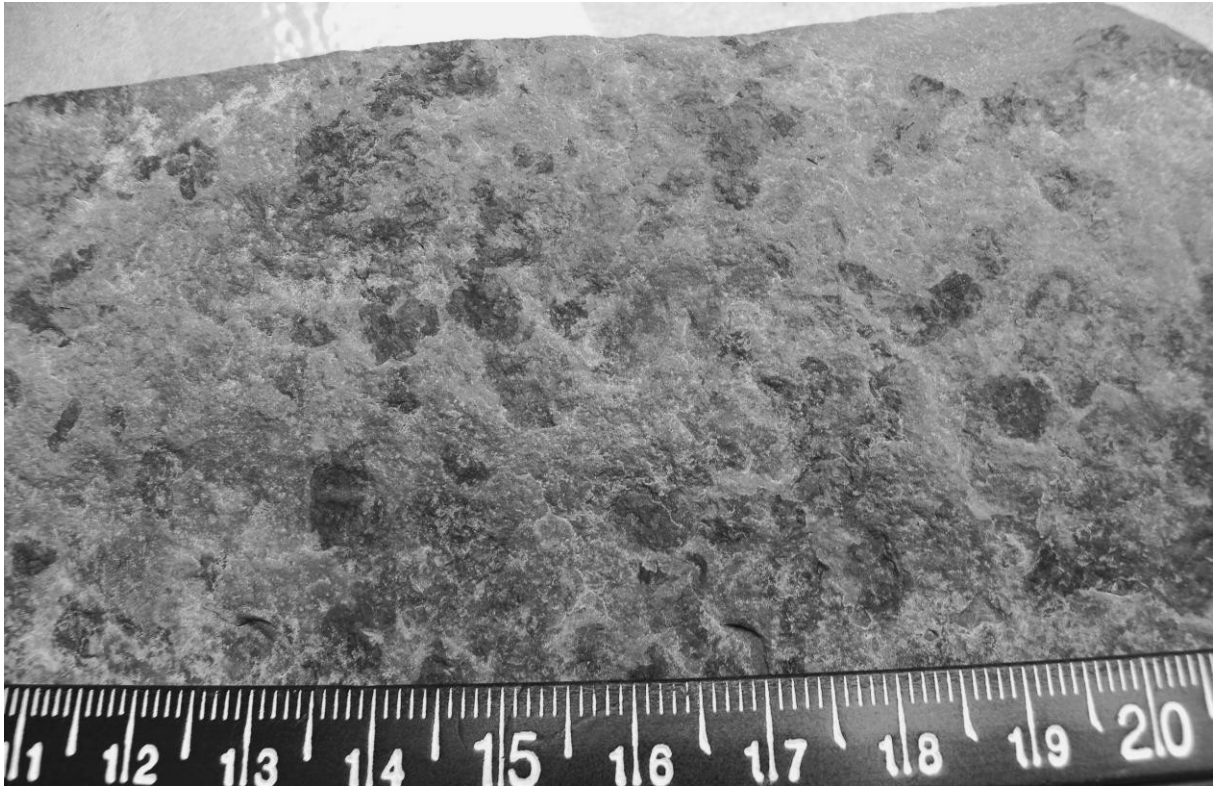


Figure 14 (above). Small area of the Blotch Horizon occurring in the upper third of Williamsville 'A' Waterlime at RQS.

Figure 15 (below) A closer view of blotches showing 'cells' (with ?spores).

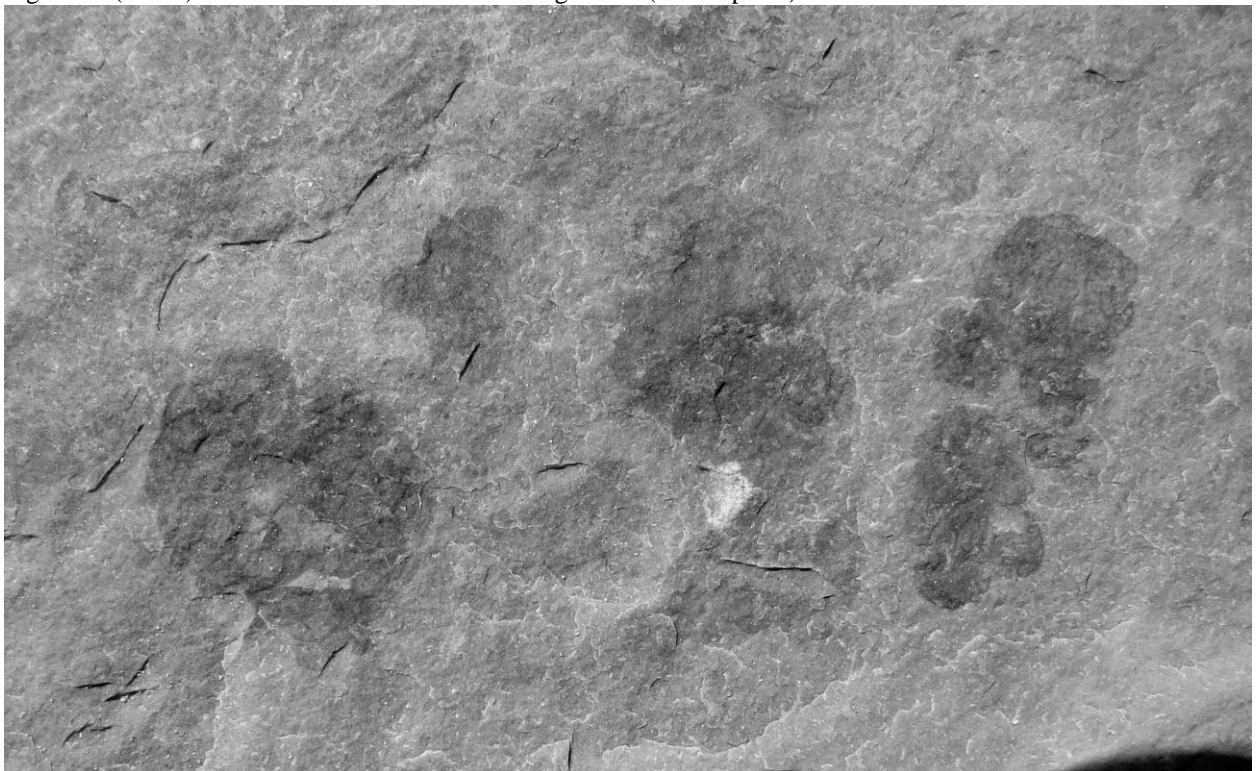




Figure 16. Small depression (scour) at the Blotch Horizon where many blotches were preserved along with *Inocaulis* (the “finger plant”), *Eurypterus lacustris* (040900-8) and eurypterid fragments. Eurypterid is ~17 cm. long, carapace is ~4.0 cm. wide. Note, this is the underside of the slab removed from the quarry floor – the eurypterid was preserved dorsal up.

Algal Clasts

Within the Bertie Group, occur irregular patches that appear to be algal clasts ripped up, transported and deposited from nearby or distant sources of microbialite activity. Such structures are most prevalent in the waterlimes of the Ellicott Creek Breccia (member) of the Fiddlers Green Formation, especially within the upper half of the unit.

In contrast, only occasionally are such structures observed within the Williamsville Formation (Williamsville 'A' submember) where microbialites are rarely observed, but eurypterid specimens are abundant. Examples of such structures are shown below.



Figure 17. A small slab (flat pebble conglomerate) of upper ECB showing many clasts. At upper right, the clast bears an intrusive salt hopper structure. At lower left is an isolated coxa of the eurypterid *Eurypterus* sp. This specimen is from the Ridgemount Quarry South, Niagara Peninsula, Ontario, Canada. Such algal clasts are observed eastward to at least the Neid Road Quarry northeast of Le Roy, New York where they are also associated with small and large stromatolites/thrombolites.

The *Eurypterus lacustris* Biota dominates Williamsville 'A' Waterlime stratigraphically higher in the section, above the ECB, and irregular patches of apparent algal nature are not often encountered. Nevertheless, over a period of years, many have been observed as isolated clasts. Perhaps most interesting is the fact that some of them, too, show that hypersalinity played an integral part of sedimentation during deposition of this important eurypterid-bearing unit. Relict halite structures are superimposed on some of them as shown in the example below.

There is also a specific horizon just a few inches below the top of Williamsville 'A' that is literally covered with small blotches (Blotch Horizon) that also may be algal in nature and resemble *Parka*, small structures well-known in England (see above). A good representative collection of specimens has been repositied in the Peabody Museum of Natural History. Eurypterid remains are also found associated on the same bedding plane. The distribution of the blotches seems to be completely limited to this horizon, and these have not been observed in New York outcrops of the Williamsville Formation. Note: The Blotch Horizon occurs just above the so-called Trackway Horizon (see Cieurca 2002).

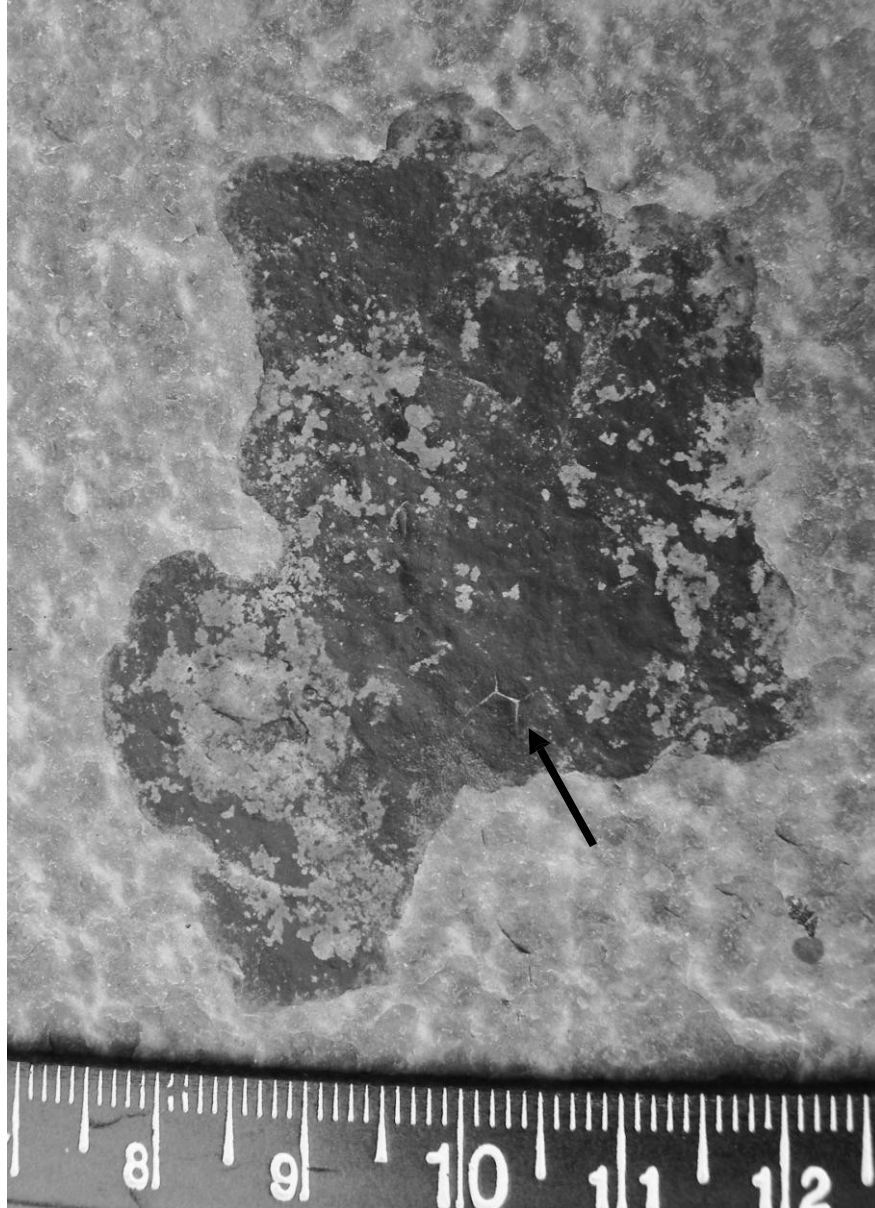


Figure18. A large, irregular patch of apparently carbonized material showing at least one relict halite structure on the patch. Perhaps this is a broken-off piece of a floating algal mass from a shallow, hypersaline lagoon. Similar relict salt structures are also found on eurypterid parts (i.e. carapaces, tergites, etc.).

AKRON FORMATION

Origin of a Massive Dolostone Complex

The Akron Fm. is generally regarded as a fine-grained, mottled dolostone heavily bioturbated. While this is certainly true, it may be that the formation owes its existence, again, to the little guys – the microbes that formed an immense sheet of carbonate mud across western New York and Canada. While it is not generally easy to access the irregular bedding planes of the unit, fortuitous encounters with weathering of enormous blocks of the Akron at RQS have revealed many structures and even a supportive fauna of ostracods, gastropods and a few brachiopod species suggestive of the microbialite origin of the unit.

Irregular and often undulating bedding planes preserve a variety of carbonaceous structures that seem to indicate a variety of algal mat types, but not of typical stromatolitic nature. At some sites, the mats seem to be interlocking suggesting that sediment was trapped and formed a network that slowly built up over time to produce up to ~5 m. of Akron Dolostone.

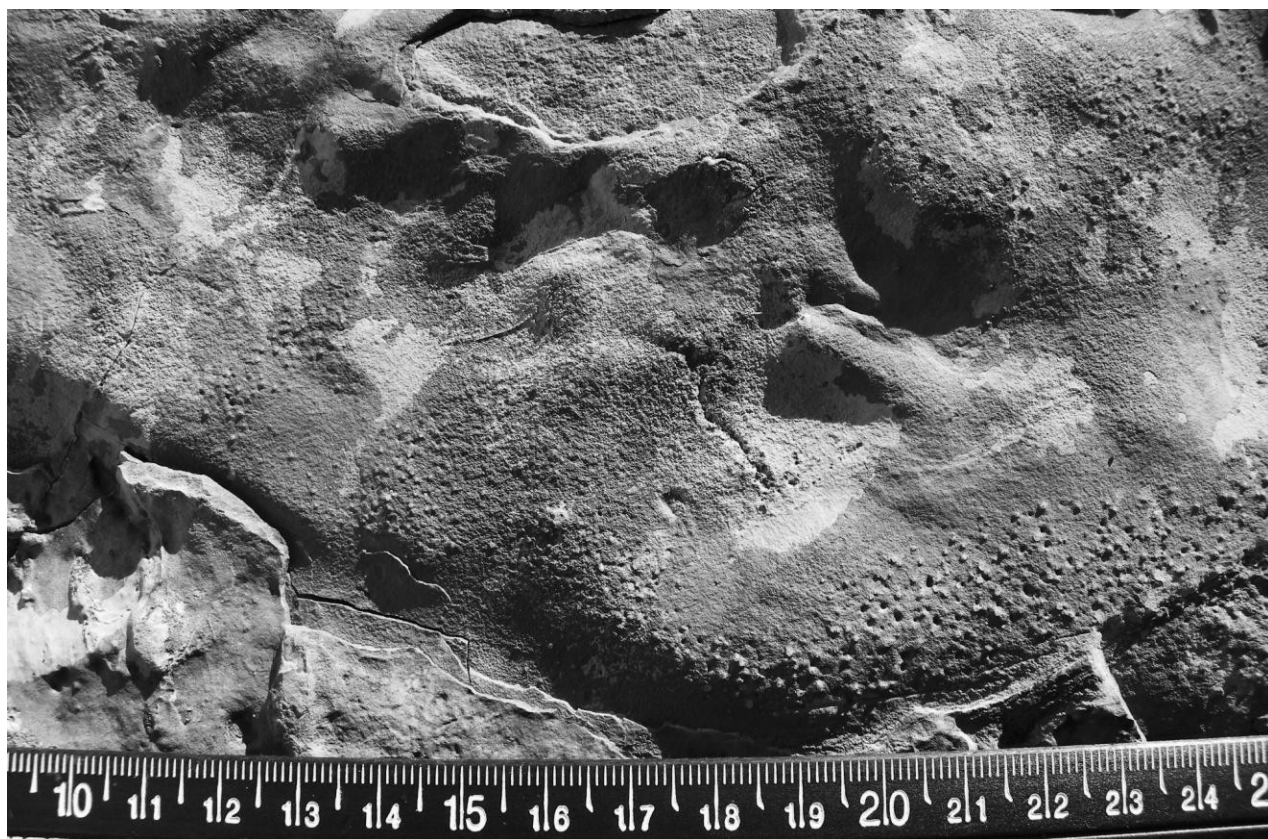


Figure 19. Crustose surface suggestive of peculiar algal mat type, Akron Formation at RQS.

Additional Examples

The Akron Fm. is exposed at many places in western New York, often at localities near the Onondaga Escarpment. Other places include quarries, especially abandoned old quarries some still available for observation (e.g. Glen Park at Williamsville, Neid Road Quarry northeast of LeRoy).

Of special note are exposures at the Clarence Sanctuary where much of the Bertie Group is preserved, perhaps one of the best sites for what the nearly complete Bertie Group looks like. At this site there are at least 3-4 m. of Akron Dolostone preserved below the Onondaga Limestone.

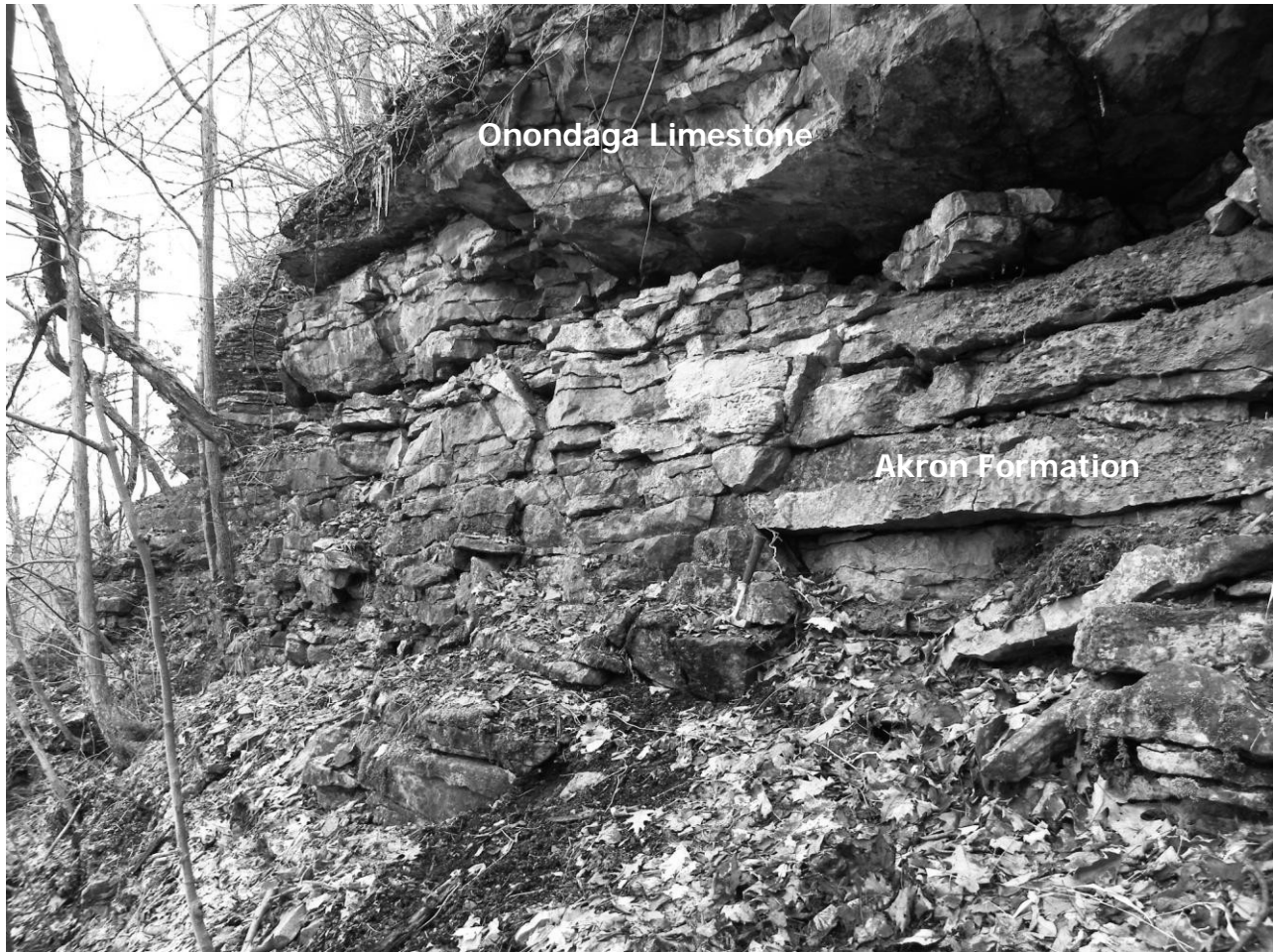


Figure 20. The Akron Fm. below the Onondaga Limestone at the Silurian/Devonian boundary. The unit has a thickness here of at least 3 - 4 m. Note rock hammer (37.5 cm.) center right in photo.

From near Honeoye Falls eastward, stromatoporoids make their appearance in the Akron Fm. (see Stock 1979) and occur sporadically to Jamesville and beyond generally forming thin biostromes (sometimes associated with tabulate corals and an assortment of brachiopods).

Eastward, beds appear to become thicker and more massive as at Mud Creek (East Victor) and seem to be more similar to the thick beds of Victor Dolostone below in the Fiddlers Green Fm. (in the past, these units caused confusion in stratigraphic interpretations). Precise correlation of the Akron Fm. with supposed eastern equivalents is not yet possible, mostly due to what Cieurca (2011) called the Auburn Seneca Falls Anomaly (ASF Anomaly). There are at least three different lithologies in the region that have been termed “Cobleskill” but that seem to occur at various stratigraphic positions.

It may be that the Akron Fm. was the more onshore facies with biostromes (stromatoporoids) and reefy masses (perhaps the “Martisco Reef Complex”) farther out and finally genuine limestone (e.g. at Frontenac Island) being still farther out, these facies forming bands around the margin of the basin. It is in the Auburn, Seneca Falls region that all three facies appear to be present and a good region for further research. Just getting the stratigraphy elucidated would be an accomplishment.

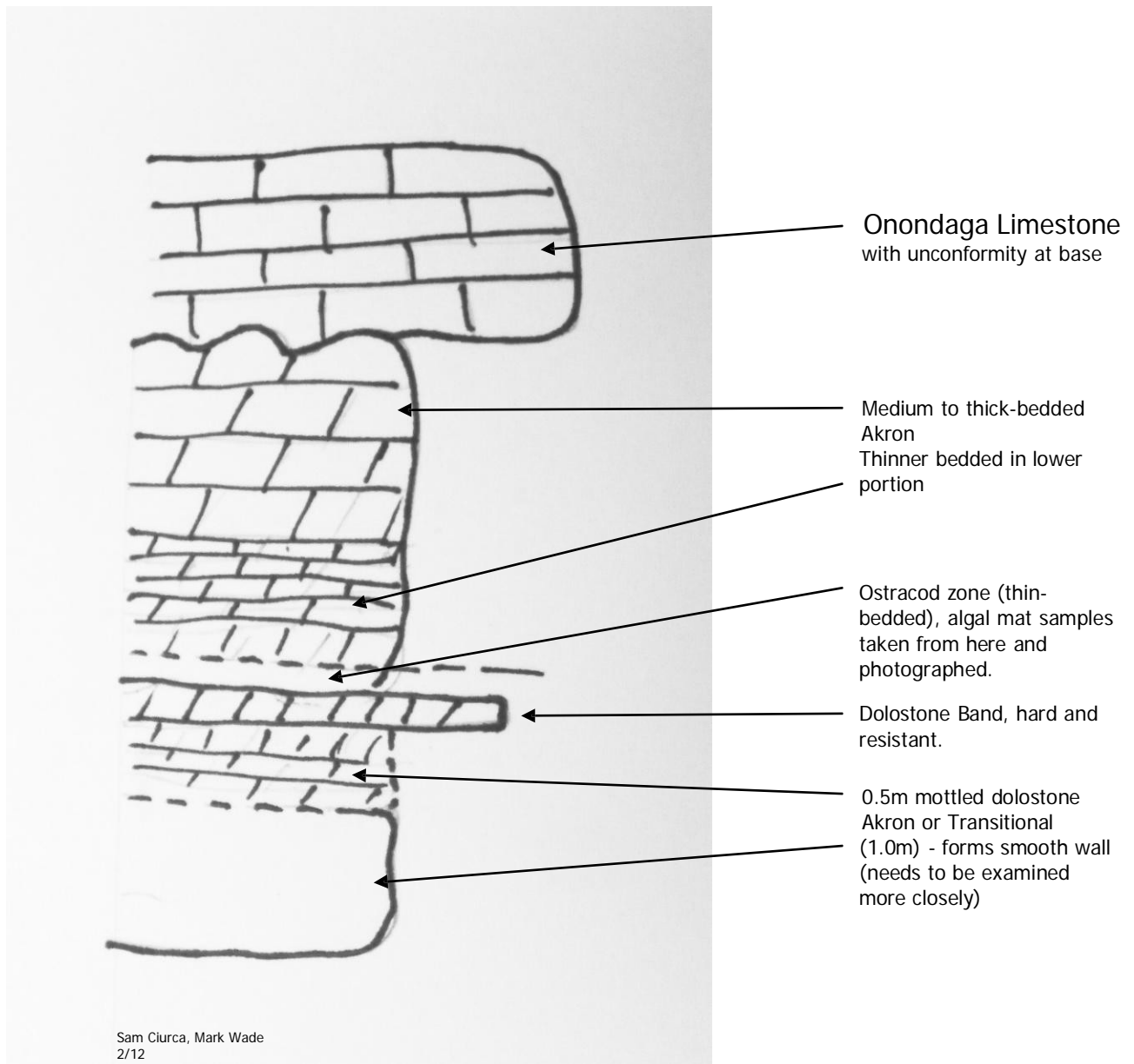
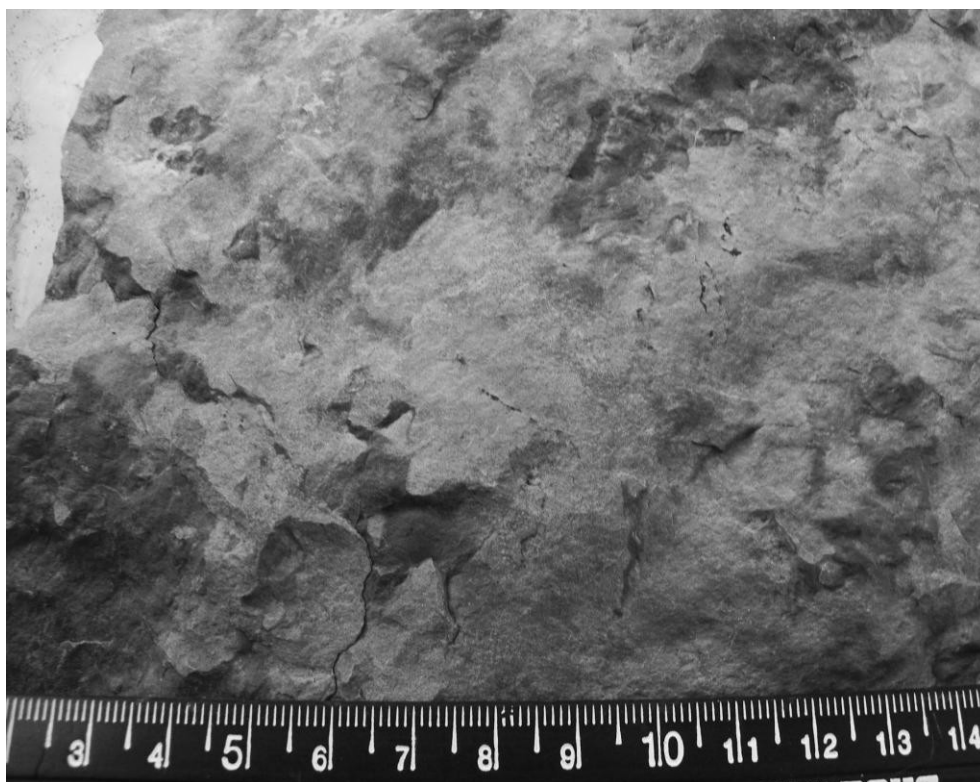
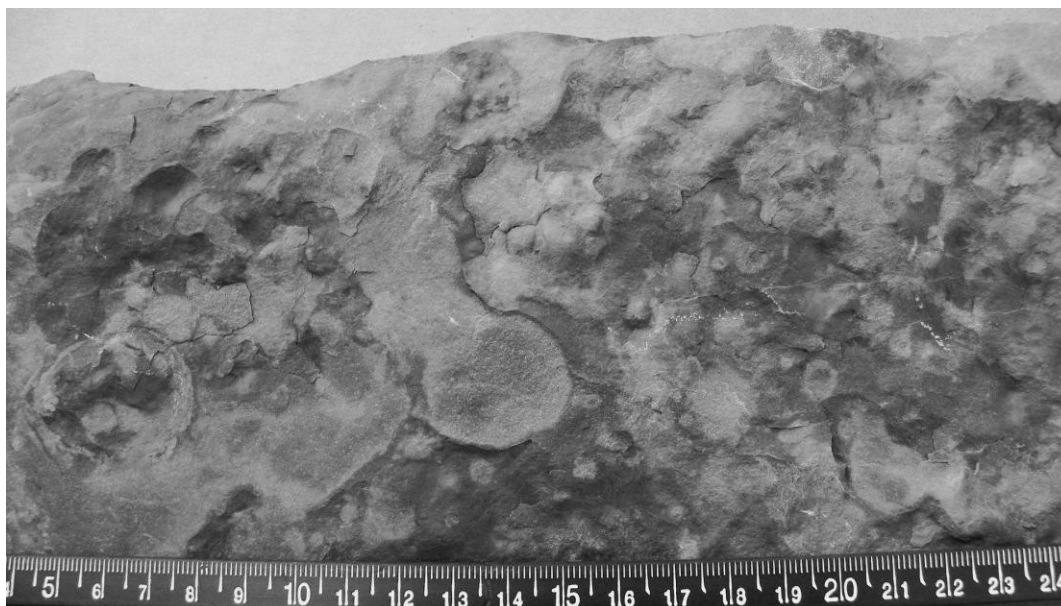


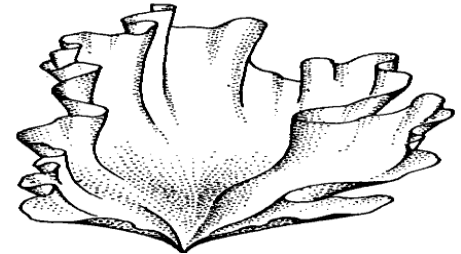
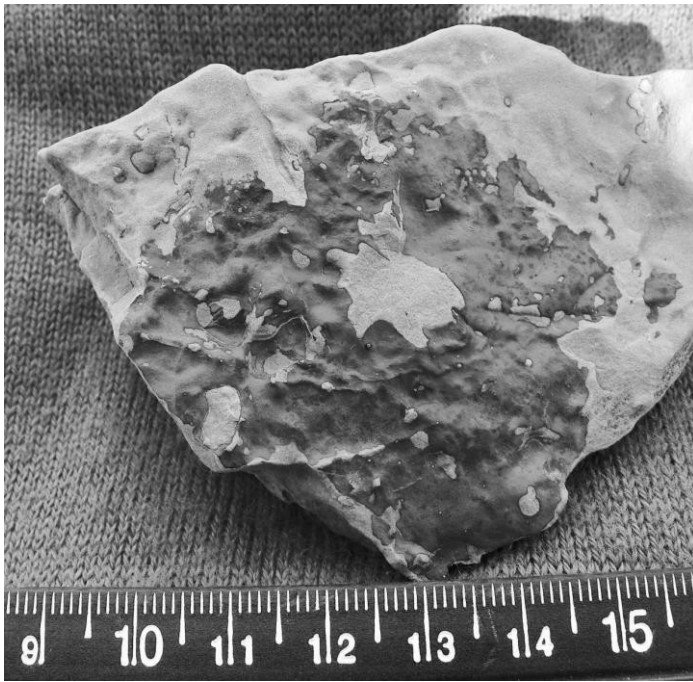
Figure 21. Notes on part of the section at the Clarence Sanctuary. The algal mat samples mentioned above are shown in the figures below. Beneath the transitional beds, the Williamsville Formation makes its appearance as a waterlime with shaly intervals intercalated. Data February 5, 2012.



Figures 22 and 23. Specimen 020512-1 Foliose, presumably carbonized algal mats are thoroughly distributed throughout the matrix with abundant ostracods and a few brachiopods (to date). Below is another example (020512-2) from the ostracod zone near the base of the 10 feet (~ 3.5m) of Akron Ds. exposed in the upper cliff (below the Onondaga Limestone).

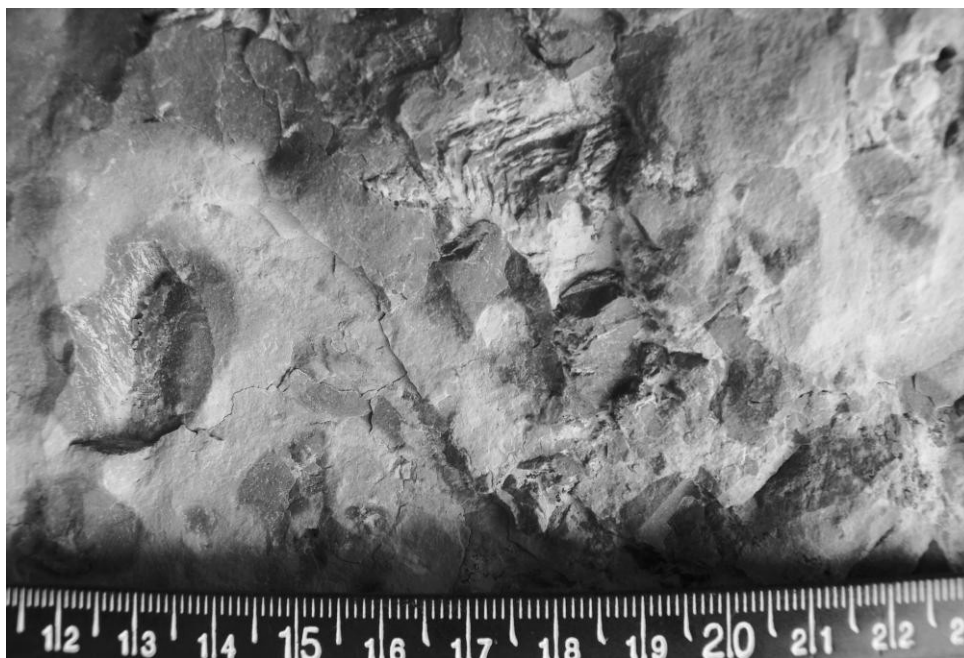


Another type of algal structure is observed at the type section – it may be a form resembling modern sea lettuce. Burrowing within the Akron is almost ubiquitous, and this presumed alga seems to show evidence of the burrowing.



Figures 24 (left) and 25 (above). Specimen 030312-1 Presumed alga, carbonized and surely compressed, Akron Fm., Akron Falls (upper), Akron, N.Y.
The drawing shows possible analog, a modern sea lettuce (see arthursclipart.org).

The Akron Dolostone, as interpreted here is a mottled, bioturbated dolostone with a variety of microbialites preserved in association with an abundant ichnofauna, gastropods, ostracods and a few brachiopods. In upper beds at RQS, salt hoppers are found with much mineralization evident (calcite, dolomite, celestite crystals), especially in rocks just below the Silurian/Devonian unconformity



Figures 26. Specimen 051098: typical, mottled Akron with salt hopper structures scattered in the matrix.

One more example may be worth mentioning. At the Canandaigua Outlet (Manchester, N.Y.), above the eurypterid beds of the Williamsville Fm., the Akron bears heavily carbonized ?thrombolites in massive tan dolostone with micrite 'locked' in place to form the massive beds. The specimen was retrieved from a large mass of the dolostone and is shown below (Specimen 090213-1).

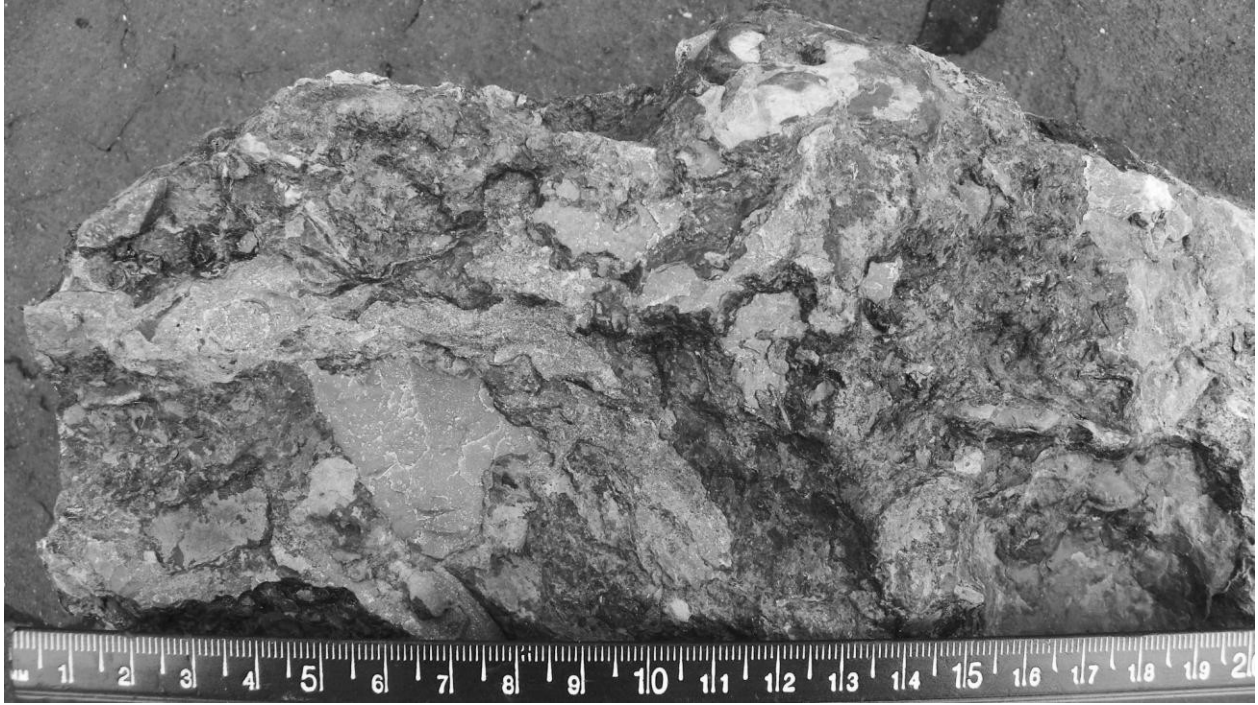


Figure 27. Akron Dolostone from Canandaigua Outlet as described above. Note the contorted carbonaceous material enclosing the fine micrite.

SUMMARY

While much is known about the eurypterids and associated faunas of the Bertie Group, a lot is yet to be learned about sedimentary structures and the paleoichnofauna of the group. Observations made over a period of over 40 years seem to indicate that microbialites also played a significant role in the development of a variety of lithologies that make up the group.

Succeeding the Salina Group, the Bertie Group was initiated in western New York by microbialites in hypersaline waters, presumably of shallow water origin. The nature of the microbialites may never be known but the fact that eurypterids make their early appearance in this basal unit, the Fort Hill Waterlime, is of importance in attempting to understand the evolution of the commonly known forms from upper beds of the Bertie Group, viz. the well-known faunas of the Fiddlers Green Fm. (*Eurypterus remipes* Fauna) and the Williamsville Waterlime (*Eurypterus lacustris* Fauna). If we are really to understand the environments in which eurypterids lived, we have to have all the facts. Microbialites within the Bertie Group may add additional facts if they can be analyzed and add to our understanding of all of the units that constitute the Bertie Group.

Lithologically, the Bertie Group is complex and part of this complexity can now be attributed to the modification of the sediments by stromatolites, thrombolites and what appears to be also a variety of algal mat types. There seems to be an evolution of microbialites through the sequence. Basic stratiform planar stromatolites start the sequence (Fort Hill Waterlime) immediately overlain by mound-types. An influx of sediment temporarily smothered this initial phase (Oatka Fm. – still hypersaline) but was succeeded by voluminous carbonates of the Fiddlers Green Fm. in which a variety of microbialites tried to dominate. Basal Fiddlers Green is simply another waterlime (Morganville) but recent observations show large circular mounds of stromatolitic nature. This is succeeded by massive, crystalline dolostone (Victor Member) with huge thrombolites and overlying stromatolites and ‘interreef’ algal mats irregularly-bedded with enormous quantities of brachiopods (*Whitfieldella*) that appear to have accumulated into shoals at some sites.

Shallowest water appears to have produced the LLH stromatolites of the Phelps Member at several localities. The stromatolites occur at the top of an important eurypterid-bearing waterlime (*Eurypterus remipes*) that may also preserve strandline deposits. The highest member of the Fiddlers Green Fm., i.e. the Ellicott Creek Breccia, bears at least three levels of stromatolite/thrombolite growth.

While little is known about microbialites in the Williamsville Fm., certain structures strongly suggest their presence, though they are not overwhelming as they are in lower strata. Finally, the Akron Fm. may owe its existence to the formation of a different suite of microbialites, but not of stromatolitic form. While dolomitization and intense bioturbation have obscured many features, closer examination of the horizontal and vertical burrows, the carbonaceous structures and the fauna that are preserved should allow for a better understanding of this peculiar mass of carbonates.

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Tod Clements (of Rochester) is a well-known eurypterid collector and I have taken advantage of our friendship – he has given me many interesting specimens or sold them to me at reasonable prices, all material having been witnessed by me as we explored the waterlime layers, especially Williamsville ‘A’ Waterlime at the RQS. (Tod is the discoverer of the first well-preserved eurypterid to come out of the Rochester Shale and kindly donated the specimen to the Peabody Museum of Natural History). Many thanks, Tod.

I have not forgotten the hours spent with Linda Heffron at the Neid Road Quarry – while I was ‘digging’ the waterlime layers, she was either looking for the rare fossils, enjoying the reclaimed botany of the place or calmly relaxing on the bedrock while reading a book (as we both enjoyed watching the vultures over head or lined up, standing at the top of the quarry walls like black statues). Thanks Linda, who does not enjoy Georgia and misses the wonderful Silurian and Devonian sections we have in New York.

As a curatorial affiliate of the Peabody Museum of Natural History, many of the specimens retrieved from the many units of the Bertie Group will be available to other researchers for study in coming years. Thanks to Dr.;

Susan Butts for many interesting exchanges and help in making sure as much retrieved data gets associated with specimens (most of the author's notes are incorporated into the collections at PMNH).

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ROAD LOG

| MILES FROM LAST POINT | CUMULATIVE MILEAGE | ROUTE DESCRIPTION |
|--------------------------|-----------------------|---|
| 0 | 0 | JCT I-290; (Exit ramp 7) with NY5. (Head east into Williamsville). |
| 0.4 | 0.4 | McDonalds on left. |
| 0.5 | 0.9 | Turn left on Cayuga St. |
| 0.1 | 1.0 | STOP SIGN Turn right on Glen Ave. |
| 0.1 | 1.1 | Parking lot on left. STOP 1 Glen Park (Ellicott Creek, Williamsville). |
| 0 | 1.1 | Leave parking lot, Turn left. |
| 0.2 | 1.3 | Mill St., Turn Right. |
| 0.1 | 1.4 | NY5, Turn left and head east. |
| 2.3 | 3.7 | JCT NY78 and NY5, continued east. |
| 8.6 | 12.3 | Adassa Auto Auction on left, site of former Louisville Quarry. |
| 1.3 | 13.6 | JCT NY93 and NY5, continue east (McDonalds on left side). |
| 1.1 | 14.7 | Crittenden Rd., Turn left. |
| 1.1 | 15.8 | Skyline Drive, Turn left. |
| 0.3 | 16.1 | Orange Gate – ENTRANCE TO AKRON FALLS PARK (turn right at Fork). |
| 0.2 | 16.3 | Turn right and park in lower parking lot. STOP 2 Akron Falls Park (Murder Creek). |
| 0.1 | 16.4 | Leave parking lot, Turn left. |
| 0.2 | 16.6 | Orange gate, Skyline Drive. |
| 0.2 | 16.8 | Crittenden Rd., Turn left. |
| 0.3 | 17.1 | STOP SIGN – NOTE FIVE POINT INTERSECTION. Make second Right onto Indian Falls Road. |
| 4.1 | 21.2 | NY77, Turn left. |
| 0.1 | 21.3 | Gilmore Rd. Turn left (before bridge over Tonawanda Creek. |
| 0.1 | 21.4 | STOP 3 Indian Falls, Tonawanda Creek, town of Pembroke. |
| 0.0 | 21.4 | Turn left out of parking lot, back to NY77 (Turn right to NYST). |
| 1.7 | 23.1 | Turn right to New York State Thruway Toll booth (Pembroke). Head east on I-90 to LeRoy exit. |
| 13.8 | 36.9 | Roadcut in Onondaga Limestone and lower units of Bertie Group. |
| 8.4 | 45.3 | EXIT 47 Pay toll, right lane to ramp onto NY19 – head straight South on NY19. |
| 2.3 | 47.6 | Parmelee Rd., Turn left. |
| 0.5 | 48.1 | Oatka Trail, Turn left. |
| 0.8 | 48.9 | Circular Hill Road, Turn right. |
| 0.4 | 49.3 | Top of Onondaga Escarpment. |
| 1.2 | 50.5 | Gulf Rd., Turn left. |
| 0.8 | 51.3 | ON LEFT: 1911 Steam shovel, may have be used at Panama Canal. |
| 0.5 | 51.8 | Neid Rd., Turn left. |
| 0.4 | 52.2 | Turn left, entrance road to abandoned Neid Rd. Quarry. Park along left edge as there are homes on the right side. STOP 4 Neid Road Quarry in Onondaga Limestone and some portions of the Bertie Group (also Silurian-Devonian boundary). |