

THE BRODIE CLUB



Established 1921

THE 1,062nd MEETING OF THE BRODIE CLUB

The 1,062nd meeting of the Brodie Club was held at 7:30 pm on Tuesday, January 15, 2013 in Room 432 of the Ramsay Wright Laboratories of the University of Toronto.

Chair: John Carley
Recording Secretary: Kevin Seymour

The meeting was attended by 37; 31 members and 6 guests.

Roll Call:

Present: Abraham, E. Addison, R. Addison, Beadle, Bertin, Bousfield, Bryant, Carley, Coady, Curry, Dunn, Eadie, A. Falls, B. Falls, J. Hussell, A. Juhola, H. Juhola, Kotenan, Larsen, Lumsden, Machin, Martyn, McAndrews, Obbard, Rapley, Slessor, Seymour, Speakman, Tomlinson, Young, Zoladeski.

Regrets: J. Bendell, Y. Bendell, Crins, Currie, Dunham, D. Hussell, Iron, Muller, Pittaway, Sutherland.

Guests: Don Brinkman, Caleb Brown, Lorna O'Brian and Greg Stuart, guests of Kevin Seymour; Sid Daniels, guest of George Bryant; and Sharon Hick, guest of Jock McAndrews.

Minutes: Minutes of the December meeting were approved subject to these changes:

1. Regrets from Sutherland were noted as omitted
2. by E-mail from John Carley *"much as I would like to gleefully report that my yard list has hit 165; in all honesty, I have to, still gleefully, report that the woodcock made it 160 !?"*
3. Corrections by E-Mail: *Nancy Hannan should be Hannah, and Kotenan should be Kotanen..*

Reports of Committees

- **Program:** B. Falls: Speaker next month will be Allan Baker of the ROM, speaking on the conservation of Red Knots.
- **Web Site:** J. Hussell: Website should be up and running by February.
- **Ontario Nature:** FON rep Glenda Slessor informed club members that the FON is very concerned about a recent recommendation from The Ministry of Natural Resources that industrial activities be exempt from key parts of the Endangered Species Act. The FON is encouraging the public to extend their concerns to the government. Because responses were to be received by Jan. 21 information was circulated by E-mail.

SPEAKER



Kevin Seymour introduced the speaker, **David Rudkin**. David started at the ROM as a summer student in 1974, involved with the computerization of specimen records and continued as a part-time technician while he finished his degree at U of T in Geology and Biology. Upon graduation, he was employed full-time, first as a Technician, then Curatorial Assistant and most recently Assistant Curator in Palaeobiology. David participated in the first ROM expedition to the Burgess Shale in 1975, and many since. He established a research program on trilobites and trace fossils of the Hudson and James Bay lowlands of Ontario and Manitoba and has been teaching second year paleontology at U of T for almost 20 years. Rudkin is now involved in the latest ROM palaeontology gallery, Early Life, representing the fossils of the Precambrian and Paleozoic.

The Life and Times of the Earliest Horseshoe Crabs

Rudkin reviewed the biology of currently living Horseshoe crabs. Their tough outer covering is a non-mineralized chitinous cuticle, which means they are not fossilized as often as organisms with mineralized coverings. Dorsally, they are divided into three parts: the prosoma, a shield which covers their head and part of the thorax; the thoracetrone, a fused part which covers the rest of the body; and finally the telson, or tail. In ventral view the jointed limbs, a pair of pre-oral chelicerae, five pairs of uniramous jointed legs posterior to the chelicerae, and five pairs of lamellate book gills are seen. Horseshoe crabs are classified as the xiphosurid chelicerates within the Arthropoda, a group which includes the spiders and scorpions. There are four living species; a disjunct population in the North Atlantic (*Limulus polyphemus*), and three SE Asian species... two classified in the genus *Tachypleus* and one classified as *Carcinoscorpius*.

Dave then reviewed geologic time. The earth formed about 4.6 billion years ago, and the first 4.0 billion years is classified as the Precambrian. During the Cambrian explosion, between 543 and about 500 million years ago (mya), fossils appear of many phyla of invertebrate organisms with mineralized hard parts. During the Great Ordovician Biodiversification Event (GOBE; about 488 to 440 mya) these lineages radiate into a large number of species, filling many different ecological niches in this marine world. Dominant kinds were trilobites, molluscs, brachiopods, graptolites, echinoderms, bryozoans, cnidarians and crustaceans. Although early chordates existed, they did not yet have jaws and so were a minor part of the fauna.

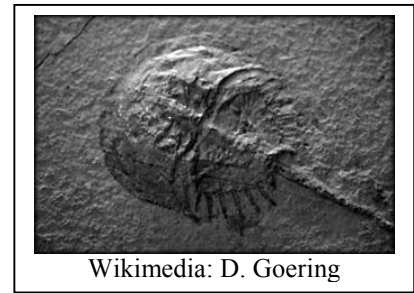
During the Precambrian there was a single land mass on earth, called Rodinia. During the Cambrian, this mass started to break up into continents, so that by the Ordovician, there were large areas of epicontinental, shallow marine habitat ringing the various continents which straddled the equator. Sea levels were the highest recorded in 500 my. The sea temperature of 40C in the early to mid Ordovician (465 to 450 mya) slowly declined to 'typical' temperatures around 30C by the end of the period (450 to 440 mya). The availability and abundance of these tropical marine areas was the driver of the increase in biodiversity, both pelagic and benthic.

The planet was a different place than it is now. The temperature averaged at least 2C higher than the average today. Carbon dioxide was 15 times higher than the Pre-Industrial era and oxygen was about 70% of today's levels. There was much volcanic activity and an increased amount of meteoric impact. The sun was weaker, the days were 21 hours long and there were 417 days in a year. The moon was closer and hence there were stronger tides. Sea levels were up to 220 m higher. Erosion rates on land were high, as there were yet no terrestrial plants. The continents were essentially empty. It was solely a marine world with just agnathans and conodonts; the sea was

empty of predatory fish. Therefore, there were not the same ecological structures as today. There was much ecological opportunity during this time, because of the ‘drivers’ listed above.

Horseshoe crabs first diversify during the GOBE. Dave was part of the team that discovered the earliest horseshoe crabs, from the Late Ordovician of northern Manitoba. The previous oldest horseshoe crab was from the Early Carboniferous. They named this new animal *Lunataspis aurora* in 2008. These fossils showed soft-body preservation, including vestiges of the cuticle and pigments. Other animals include eurypterids, jellyfish, green algae, polychaete worms and sea spiders, also the earliest known. This environment represents a shallow, near-shore restricted marine setting. Since that time, additional specimens of juveniles, revealing the body proportion changes that occur during ontogeny, have been located.

Their discovery was not to remain ‘the oldest’ for long. In 2010 the Lower Ordovician Fezouata fauna of Morocco was discovered, and this included even more primitive horseshoe crabs with even their limbs preserved. It represented a different environment: a deep, open-water, low-energy, fully marine habitat, which included echinoderms, brachiopods and trilobites, typical marine organisms not seen in the Manitoba localities.



Interestingly, there were also anomalocarids, a hold-over from the Cambrian (and the top predator recorded in the Burgess shale-type deposits). The Fezouata horseshoe crabs had a long telson like the living species, where the Manitoba ones had been reconstructed with a short telson. With additional specimens now found from Manitoba, including some intact specimens of *Lunataspis* with a long telson, the initial reconstruction has been determined to be incorrect.

At the end of the Ordovician, a sharp drop in global temperature was followed, at least on the southern continents, by an Ice Age. The amount of water contained in the glaciers was reflected in a drop in the global sea level, a draining of the epicontinental seas and a crash in the marine biodiversity around 443 mya. Horseshoe crabs survived this event. However, to date there are no fossils of them from the Silurian or Devonian. They next reveal themselves in the Carboniferous, where they peak in diversity at about 12 genera. They also survived the great Permian extinctions, when over 90% of life on the planet went extinct. They have a modest presence in Mesozoic faunas (especially Jurassic), and a poor Cenozoic record, but they are still with us today.

QUESTIONS AND ANSWERS

Q. Abraham: Why did they survive?

A. We don't know. A supposition is that the body plan works, and that perhaps their habit of laying eggs above the high-tide mark enabled some of their young to survive, that might not have survived if they had laid them in the ocean.

Q. Bousfield: How do they feed?

A. Limb morphology shows they have always been bottom feeders, eating such prey as molluscs and brachiopods.

Q. B. Falls: What kinds of creatures eat horseshoe crabs?

A. Many species will eat horseshoe crab eggs (e.g. shorebirds), and fish, gulls and crustaceans will eat juveniles, but there are few predators other than sea turtles and sharks that will tackle an adult. During the Ordovician cephalopods were a predator. Today humans are a major predator of adults, taking large numbers to be chopped up for bait, hog feed and fertilizer.

Q. Curry: Their immune system is reported to be very strong, perhaps this is part of the answer to their long survival on the planet.

Q. Kotanen: Do we know when (geologically) they started laying their eggs on land?

A. No. The best way of discovering this might be through finding trace fossils of their nests, but these have not been recorded yet.

Q. Abraham: If all their predators were in the ocean, perhaps this was reason enough to lay their eggs on land.

A. Yes, initially. Now, not so much!

Q. Daniels (guest): The juvenile *Lunataspis* you showed looked like it had a three-lobed thorax, like a trilobite.

A. Yes, in their early growth stages (in the egg) they look remarkably like a trilobite. In fact, the earliest larval stage shows no telson and is called the trilobite stage.

Q. Addison: The modern distribution of SE Asian horseshoe crabs appears to only be on the west side of Wallace's Line. Is there a connection?

A. Yes, this may be the case, but the area is tectonically complex. It may be that plate tectonics is the answer to explain their modern distribution, which happens to correlate with Wallace's Line.

The speaker was thanked by Curry.

OBSERVATIONS:

Eadie: provided an audio copy of Bodsworth's memorial for the archives and any member who wished could make a copy. She also reported on two books, David Resnick's Origin Then and Now and Richard Dawkins' Greatest Show on Earth.

Dunn: On 29th December one Rusty Blackbird was observed at their feeder in Simcoe- first record for their yard. On the 30th, two were observed; none have been seen since. There was a heavy snowfall on Dec. 19th.

Rapley: the Rouge Park Christmas Bird Count (CBC) recorded 61 species and 7,000 birds, with 120 observers. Unusual species observed included Trumpeter Swan, Red-bellied Woodpecker and Barred Owl. The 2012 Rouge BioBlitz was in June and recorded 1400 species. The 2013 Rouge BioBlitz will be September 15.

Carley: three species were recorded on the 2012 Toronto CBC for the first time; Indigo Bunting, Blue-gray Gnatcatcher and Nashville Warbler.

Coady: On the 2012 Oshawa CBC, three new species also were recorded; Eurasian Wigeon, Black-legged Kittiwake and Western Tanager.

Larson: appears to be an irruption year, with more Pine Grosbeaks, Evening Grosbeaks and Bohemian Waxwings than normal.

Daniels (guest): Found 12 inch dew worms on the surface of the ground in January... unprecedented...previous latest date was October. They must have surfaced because the heavy rains (29 cm on Jan. 13 in Aurora) removed the frost layer which normally keeps them deeper in the soil. (Photo of January worm activity in Aurora -Addison yard.)



Abraham: Yes, the hard rain at first pooled, but by the afternoon it was gone, so it must have penetrated the frost layer in order to drain.

The meeting was adjourned at 9:28 and refreshments were enjoyed by all.

CORRESPONDENCE:

Ken Reading sent the following by mail:



Thornhill: 24/12/2012

Dear Friends;

I was delighted to be given copy of The Brodie Club's Proceedings from 1936 through 1951 to add to my more recent collection of Club meeting summaries.

Perusing them was fascinating and doing so brought back to me many fond memories from some of those earlier times!

For example I hadn't previously known that Bob (R.V.) Lindsay and Doc (John) Oughton weremembers as early as 1936.

Doc, in the mid-forties, was a principal mentor of mine, as too was Bob Lindsay.

I see that Doc dropped active membership around 1946 or so. It was likely when he moved from the ROM to teaching over in the OVC at Guelph; I used to bicycle (!) over there to spend weekends with him. Did so until he then went to St. Andrews down in New Brunswick.

Much time was spent with R.V. during his years at High Park, to which he had been moved after a bad mauling by Hyenas at the Riverdale Zoo.

Bob (R.V.) spent several summers with us in northern Ontario doing mineral exploration; during those times he and I ran a trapline for mice and shrews!

Bob's note in the 1946 Proceedings about wild deer in High Park refers to the sudden and unexpected appearance of Romeo, a buck that jumped an 8-foot fence to court Juliet in her pen, who chose to remain close to his newfound Love in the park.

In the 1949 Proceedings, a Vermillion Flycatched was observed in High Park. Hah! I spent several days with Bob hunting for it, a 410 guage shotgun held firmly down inside his pant-leg, loaded salt shells..... the intent being to add a skin to the ROM's collection. No success, however.

In the 1950 Proceedings R.V. read a paper on the Pilot Black Snake in eastern Ontario and displayed a distribution map of its occurrence there. I made that map for him - and still have it here someplace.

I note, too, that in 1951 R.V. reported a tame-acting Weasel. That was most interesting ibid my own experience years later in the far north when I shared a tent during freeze-up for a number of weeks with a markedly tame Least Weasel!

All in all I very much enjoyed seeing so many fo the old names from back then again, some of which I'd long forgotten!

These "paper" records are indeed most useful!



On Jan. 3 *Ken Abraham* sent a link to video clips from Jouce Prop who studies Barnacle Geese in Svalbard <http://www.youtube.com/user/joukeprop/videos> and links to two related pdfs.

Ken E-mailed " I think the consensus is that the frequency of polar bears raiding goose colonies is increasing in recent years (last 2 decades), but I don't think it was unprecedented. There are some good articles on the subject (about 5-6 articles from different parts of Canada and Europe). One by a colleague Rocky Rockwell in Polar Biology outlines how the earlier ice melt has meant there is more frequent overlap between bears on land and geese still incubating eggs. Formerly, the bears would have been on ice later into summer and the geese would have had goslings."

NEXT MEETING

The next meeting will be held Tuesday, February 19 at 7:30 pm in Room 432 of the Ramsay Wright Zoological Laboratories.

Allan Baker of the ROM will discuss **Red Knots**.

FROM THE ARCHIVES

January 1988:

John Speakman saw a Virginia Rail walking on the snow in a marsh near Sunderland.

Dr. Trudy Nicks, speaking on "Indians, Animals and the Fur Trade" noted that native northern people shown pictures of Kermit the Frog and Fozzy the Bear considered them to be turn-offs

