THE BRODIE CLUB

Established 1921

Website: http://thebrodieclub.eeb.utoronto.ca

THE 1,110th MEETING OF THE BRODIE CLUB

The 1,110th meeting of the Brodie Club was held on Tuesday, 17 April, 2018 in Room 432 of the Ramsay Wright Laboratories of the University of Toronto.

Chair: Ken Abraham

Secretary: George Bryant

The meeting was called to order at 19 :30 pm and was attended by 31; 26 members and 5 guests.

Roll Call:

Present: Abraham, E. Addison, R. Addison, Beadle, Bell, Bertin, Bryant, Coady, Crins, Currie, Daniels, DeMarco, Dengler, Dunlop, Dunn, A. Falls, B. Falls, Hussell, Iron, Kortright, Kotanen, Martyn, Moldowan, Pittaway, Seymour, Thomas.

Guests: J. Bacher and Mary-Lou Jorgenson-Bacher (H. Juhola), Ron Dengler (Dengler), Terry Whittam and Betty McCulloch (Iron and Pittaway).

Regrets: Carley, Curry, Eadie, Johnson, A. Juhola, H. Juhola, King, LaForest, Larsen, McAndrews, Obbard, Peter, Rapley, Rising, Slessor, Sutherland.

Minutes: There were no errors or omissions to the minutes. Minutes approved.

Business Arising: E. Dunn noted that cards and flowers had been sent on behalf of the Club to Jim Bendall and Trudy Rising. She read part of a thank you from Jim, and K. Thomas read one from Trudy. A. Bell reported that a scholarship fund was being established at the University of Toronto in memory of Jim Rising.

Committee Reports:

Field Trips: (R. Curry) The secretary read the following from Curry. The Brodie Club Annual Field trip will be at Carden Alvar on **Saturday, June 16**. It is four years since we have been to Carden, considered by many to be the second most significant natural history destination in the province after Point Pelee. Ron Reid, Carden Program Director, will arrange for us to access areas not available to the public. Full details at the May Brodie Meeting. Bob Curry, Justin Peter, Hugh Currie (Field trip Committee)

Program Committee (E. Addison): Members A. Bell and J. DeMarco will discuss Madagascar at the May 15 meeting.

New Business: J. Iron expressed concern about endeavours by an organization to develop a shooting range on property adjacent to Carden Alvar, which could threaten the integrity of the alvar and the some of the species at risk. Further information will be distributed to members by email.

Announcements:

K. Seymour announced a special exhibit by the ROM in June on spiders, including various venomous critters.

<u>SPEAKER:</u>

Member Ed Addison needed no introduction. His subject was "Ecology of Parasitism: A Naturalist's Hike through the Ontario Underworld." Most the varied images of parasites, parasite hosts, and parasitized viscera he showed had been taken by him. The presentation was a tour de force by a now-retired parasitologist of his lifework.

The term "parasite" has numerous definitions, but most simply it is one animal living on or within another animal. Ed's preferred definition of ecosystem is "a biological community of organisms interacting with one another and their physical environment" – i.e., the parasites are part of an ecosystem. This was a consistent theme throughout the talk. Ecosystems can be nested within one another. For example, we live in the Great Lakes Forest terrestrial ecosystem, within which are lake and pond ecosystems, with beaver lodges nested in them. Finally the beaver itself is an ecosystem, at least from a parasite's point of view.

Beaver lodges are probably the warmest non-human component of the Algonquin ecosystem in winter. In winter, beaver lodges and hibernating bear dens in Algonquin are the only above water sites with temperatures above freezing. Very few beetles are parasitic, but the year-round warmth of beaver lodges makes it possible for two beetle parasites to co-habit with them. Fur trappers find these when skinning their animals.

All species of animals take nutrients from their ecosystem, and parasites are no different. Some parasites can of course be harmful such as tularemia which wiped out most of the beaver in parts of northwestern Ontario about 65 years ago. MNR trapped and transported Algonquin beavers to re-populate the area. Nonetheless, parasites can also be partly or wholly beneficial to their host. Beavers provide a good example of this, too. Years ago, Ed was surprised to observe a female beaver re-ingesting her feces. There are millions of *Escherichia coli* bacteria in the beaver lower intestinal system. Bacteria are not tolerant of stomach acid, but beavers need these bacteria in the caecum to digest nutrients. Coprophagia (eating feces) was once thought to be unique to rabbits, but it turns out that many herbivores do this. Others ingest needed bacteria from other sources, such as moose calves eating dirt.

Many other parasites have no obvious benefit to their hosts, but cause no obvious harm, either. For example, about 30-40% of Ontario mink in the Georgian Bay area have parasitic kidney worms, sometimes collectively up to 4 feet in length. Amazingly, infected mink are as large as uninfected animals and appear to carry on as normal. The kidneys compensate by getting larger, but there is no measurable effect of this parasite being harmful to the host. Parasites that kill their hosts are in danger of going extinct, and with enough time to co-evolve, many parasite-host systems come to a live-and-let-live equilibrium.

On the other hand, parasites introduced to a new ecosystem with no co-evolved defences can cause havoc. For example, vesicular exanthema of swine virus (VESV) is an acute, highly infectious disease, which in 1932 caused mass mortality amongst pigs in southern California. The disease was confined there until 1952 when a train with a dining car brought raw pork to Cheyenne, Wyoming. By 1953 the epidemic had spread to 42 states, and cost $320,000,000 to eradicate. In 1972 the source was found to be the Opal-eyed Fish, a native of southern California—which itself was unaffected by the virus.

Moose and deer provide more examples. Moose have only been in North America for 8-15,000 years, and though they brought their own parasites with them, they have not had much time to develop protections from the novel parasites they have met here. Roy Anderson studied the life cycle of meningeal (brain) worm in White-tailed Deer in Algonquin Park. The deer ingest snails or slugs with the worms, the larval worms follow the deer spinal column and enter the meninges but cause no apparent harm. Moose sympatric with deer are subject to the same parasite, but the results can be fatal. Cross-sections from brains of infected moose show abundant brain parasites. Ed showed a dramatic picture of swirls of moose tracks on an ice-covered lake terminating in a dead moose, a pattern giving rise to the name "circling disease." Another photo showed a wild Algonquin moose posing with a cap placed on its head, and this animal was doubtless also a victim of the brain worm.

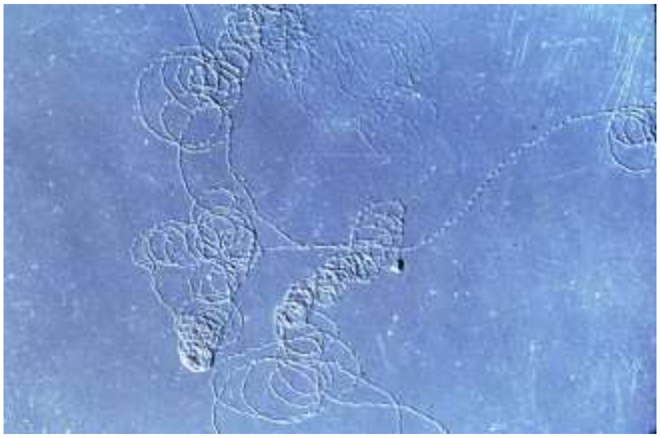
Photo by Warren May, on Eagle Lake near Dryden

We were treated to multiple images of parasites in various organs, including moose lungs with large cysts and livers with flukes. Moose have no immune response to larval tapeworms as they have evolved together over a long time, whereas deer liver fluke evolved with deer but have been transmitted to moose. Ed spent a number of years studying winter ticks in Algonquin Park. This is another parasite that hits moose particularly hard. Some have been observed with over 80,000 ticks. The poor animals can lose so much blood and hair that they succumb during late winter.

To summarize parasite relationships, the longer the relationship within an ecosystem the better to evolve a balance between host and parasite. It is a matter of evolutionary time.

Some parasites make regular movements within their host, analogous to the diurnal movements of gulls, for example, going to roost on water and coming ashore in the daytime to forage. Some tapeworms also make regular movements. Because they lack an alimentary tract they need to be near the stomach of their host, but they can't tolerate acidity. They move towards the stomach when the host eats, then retreat into the intestines when host digestion makes the environment too acidic.

One of the biggest challenges a parasite has is how to get itself (or its progeny) into a different host. They have evolved exquisite strategies to respond to the challenges of transmission.

The microfilarial worms of beavers, for example, have to get into an animal that is protected by fur and lives mainly under water. Their solution is to travel via mosquitoes, which are attracted to the CO^2 wafting out of breathing apertures in beaver lodges. The only place they can attack the beaver is between the scales in the tail, an area of the beaver that is heavily vascularised. Bears also have microfilaria worms, but they are transmitted by black flies. The worms time their movements within the host to ensure they are close to skin where the insects commonly bite, at the time when those insects are most active: a phenomenon known as “microfilarial periodicity.”

A trematode that infects killifish brains causes them to alter swimming behaviour and move closer to the surface, making them more available to be eaten by the birds which are the next host in the life cycle.

Sometimes knowing about the life cycle of a parasite can tell you about food habits of the host. For example, the life cycle of bear lungworms includes both bears and snails. We don’t see bears eating snails, but because they have lungworms we know snails must be part of the bear’s menu.

There are many parasitic species out there to be identified. Ed showed an images illustrating the thousands of interrelationships of organisms in a single California salt marsh. A second image added parasites to the picture, and the linkages rose geometrically.

Questions following the presentation:
R. Dunn: Given your definition of parasitism, am I right in thinking you’d include commensalism and mutualism? A: Yes.

S. Daniels: Where do microfilaria worms go in the off-hours?
A: majority in the lungs and spleen, the lungs being highly oxygenated. We can see 100,0000 in a micro-litre of bear blood but there is no harm to the bear. By contrast there seems to be no parasite periodicity in beavers, which are transmitted by mosquitoes that are hanging out inside lodges and feed any time of day or night.

J. Bacher: Can a parasite of humans evolve elsewhere? A: Yes, Ebola, HIV, all developed in other ecosystems before getting into man.

T. Whittam: As a beekeeper he can attest to the impact of new parasites. Cost of honey production has been dramatically increased because of varroa mites.

O. Bertin: Have you ever picked up a parasite? A: Years ago, the Lake of Two Rivers swimming area had a serious *E. coli* problem. One of the identified sources turned out to be the upstream MNR Wildlife Station, which had a terrible septic system, and this was a big embarrassment to the government. Ultimately, though, the source was found to be the beavers being studied at the station rather than the septic system.

OBSERVATIONS

R. Dunn: The spotted wing fruit fly, Drosophila suzukii, originally from southeast Asia, has become a major pest species of soft fruit crops across North America. It also affects wild fruits, and birds that are frugivorous during fall migration declined in a recent study of a small area. More work is needed to learn whether this fly might lead to widespread declines in populations of migrant frugivores.

J. Bacher commented on a recent N.Y. Times article which reported a major decline in Europe of wild bird species.

Taking a break from a curling bonspiel near Glasgow, W. Crins observed a wren assiduously collecting moss and assembling a nest. He has seen many Winter Wrens in North America but never one nest-building.

Feeder activity: R. Pittaway reported three Fox Sparrows; K. Seymour a Song Sparrow finally singing.

K. Abraham noted a report of Rusty blackbirds catching and killing Pine Siskins. Apparently, this is not uncommon in northwestern Ontario, and certain other species (including Eastern Meadowlark) will also kill and eat smaller birds during hard times.

Meeting adjourned at 9:03

Art work by Ken Reading