THE BRODIE CLUB

Established 1921

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

THE 1,120th MEETING OF THE BRODIE CLUB

The 1,120th meeting of the Brodie Club was held on Tuesday, 21 May, 2019 in Room 432 of the Ramsay Wright Laboratories of the University of Toronto.

Chair: Ken Abraham
Secretary: Ed Addison

The meeting was called to order at 7:33 pm and was attended by 30; 23 members and 7 guests.

Roll Call:

Present: Abraham, E. Addison, R. Addison, Bacher, Beadle, Bell, Bertin, Coady, Crins, DeMarco, Dunlop, Dunn, A. Falls, B. Falls, Hussell, Hutchinson, Iron, Juhola, Kortright, Obbard, Pittaway, Reading, Thomas.

Guests: Rob Falls (guest of A & B Falls), Liz Stravinsky (E. Addison), Peggy Haist (Bertin), Ross Harris (Thomas), Clara Thaysen, Katie Ziebart and a male guest whose name we missed (guests of the Club).

Regrets: Bryant, Daniels, Dengler, Eadie, King, LaForest, Lindsay, Martyn, Moldowan, Riley, Seymour, Stones.

Minutes: Minutes of the April meeting were approved. (Thomas/Bertin)

Committee Reports:

Field Trip Committee: Thomas reminded us that the field trip will be at Darlington Provincial Park beginning at 10 A.M. on June 9. Access is off Hwy. 401 between Oshawa and Bowmanville at Courtice Road. It is hoped that there will be a presentation by the park naturalist. The trip will also visit Second Marsh. Details are being distributed with these minutes.

Announcements:

Bill Crins announced that the hover fly field guide that was partly online previously has now been published as a book: Field Guide to the Flower Flies of Northeastern North America, by Skevington, Locke, Young, Moran, Crins and Marshall (2019). Available for $37.54 on Amazon.

SPEAKER:

Obbard introduced the speaker, Chris Wilson of the Aquatic Biodiversity and Watersheds Unit of the Ontario Ministry of Natural Resources and Forests (MNRF) in Peterborough. Wilson completed an M.Sc. degree at the University of Windsor and a Ph.D at the University of Guelph. Following a postdoctoral position at the Australian National University in Canberra, Chris joined the MNRF fisheries research group as a research scientist in 1998. Chris continues in that position, 20 plus years later.

Lake Trout Evolution and Paleoecology: from ice age origins to the present

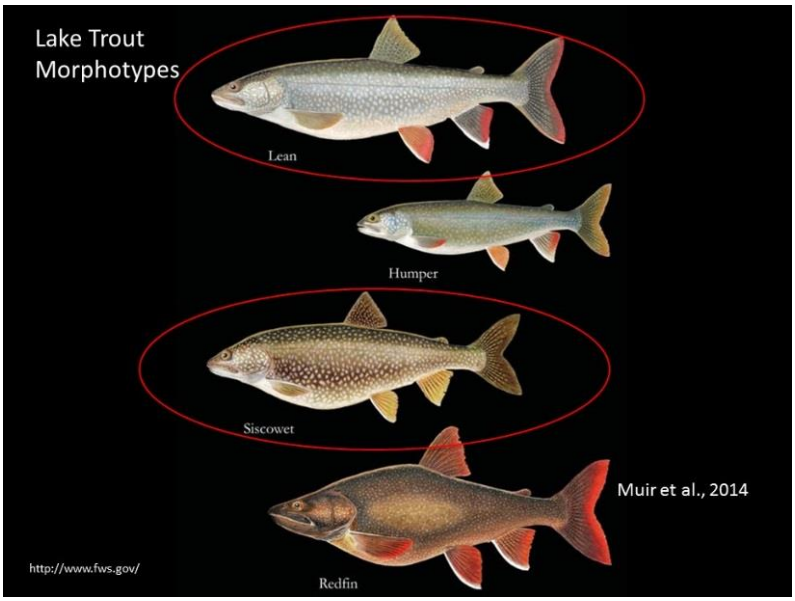
Lake trout (LT) evolved exclusively in North America in conjunction with multiple Pleistocene glaciations, in habitats which were dark, very cold and that had low productivity. These types of habitat are currently very rare and best approximated by Great Bear Lake. The physical attributes of these habitats influenced the physiology and life history traits of LT. Unlike other salmonids, LT live for a long time with some perhaps 50 years old. There are many variations in their morphological forms yet LT are very limited in variation as compared to other salmonids. For example, they generally come only in shades of gray, lacking the vivid bright colours often assumed by other salmonids, particularly during the spawning season. Because LT are deep water fish for much of the year and there is limited light at the depths where they live, colour would not have specific advantages. During the spawning season, LT would rely more on movements to communicate sexual cues. Perhaps not surprisingly, LT have better low light vision than do other salmonids.

There are only two fossils of LT, both too recent (10,000-16,000 years ago) to provide clues as to their evolutionary history. The near absence of fossils is attributed to the dynamic changes in advances and retreats of ice edges where the LT evolved and lived. One of the other ancient relatives of LT that has survived into the present is *Hucho taimen*, the Siberian taimen. It is the largest salmonid and is found in Russia and other areas of northern Asia. Unlike North America, those areas have few lakes, and the taimen is exclusively a riverine species. The taimen and LT are similar in having large size, low sexual dimorphism, long lives, and posterior placement of the dorsal fin. While some have suggested that taimen and LT arose from a common ancestor, it seems more likely that these similarities are the result of convergent evolution. Brook trout and LT appear to have diverged from a common ancestor about 2.5 million years ago late in the Pleistocene, although estimates are highly variable.

LT prefer temperatures of 8-12^{o}C and dissolved O_2 of 8-12 mg.L^{-1} and are limited in summer to the colder hypolimnion of lakes. Given that the species is millions of years old, whereas lakes tend to last only 20,000-30,000 years, how has it survived? Distribution of water was massively different in the past than currently, and drainage shifted dynamically with the advance and retreat of the glaciers. At one point there was a very major river, Bell River, draining the North American southwest to northeast across what is now Hudson Bay and emptying into the Labrador Sea. At the end of the last glaciation there were numerous very large glacial meltwater lakes along the southern edges of the glaciers. One of the largest postglacial lakes was Lake Agassiz which was upwards of 200m deep with maximum surface area of up to 440,000 km^2, making it larger than the current Great Lakes combined. Lake Agassiz and the other large postglacial lakes comprise quite a bit of

the current distribution of LT, although there are insufficient lakes in southern Manitoba and Saskatchewan to support LT. It is only for the past 8,000 years that LT have not moved geographically and have instead been trapped in "island lakes" surrounded by "a sea of land."

Other glacial relicts from the same period: the crustacean *Mysis*, marine amphipods, deep-water sculpin and other groups, were also pushed by ice movement to freshwater systems occupied by LT, perhaps originally from marine ecosystems. They or their subsequent descendent relatives form important parts of the current food web supporting LT.



While there are phenotypic differences in strains of LT, their physiological requirements are consistent, and constrained by their tolerance to temperature and O^2 concentrations. There are three distinct strains of LT in Lake Superior: lean, siscowet and humper forms. The siscowet forms are very fatty, living to a large extent on a diet of cisco. LT in Algonquin have specialized based on what they eat. In some lakes, LT feed on other fish species and can be large whereas in others they feed only on plankton and are lean.

Questions following the presentation:

Bertin said he found a population of Lake Trout deep in Gillies Lake (Bruce Peninsula) while doing fish surveys in 1973. Virtually every other limestone lake on the peninsula is shallow, warm and full of Smallmouth Bass, but Gillies Lake is surprisingly deep (120 feet, from memory). He lowered gillnets down into the depths and to his great surprise found Lake Trout, as also found by MNR in their surveys of the lake. As the lake is isolated, perhaps the trout have been there since the Ice Age.

B.Falls *asked about effects of global warming on LT*. There will be no worries in the deeper large lakes. There will be more difficulties for LT in smaller lakes where O^2 concentrations decrease over the summer months and may reach concentrations below the limit of tolerance of the trout.

Reading: *What evidence is there of relic salmon in Lake Agassiz?* LT were the only salmonid in Lake Agassiz. Decades ago, Reading found some very salmon-appearing fish in Mesomikenda Lake east of Gogama

Thomas: *Are all LT in North America?* Yes. *Are there equivalent species to LT elsewhere in Asia*? No, because they do not have the lake habitats within which LT have evolved. Asia only has the giant taimen.

E. Addison: *What are the different food webs of LT?* Those based on 1) *Mysis*, 2) cisco and other fish, and 3) plankton (e.g. Lake Louisa in Algonquin).

Coady: *What causes the LT in Great Bear lake to be so large?* Cisco and lots of other fish in the diet of LT.

Crins: *There is a small morph of LT in Michigan.* Yes, they feed only on invertebrates and are only found in parts of Michigan.

Coady: *Are some of these morphs along the pathway to speciation?* Yes. We are now down to 3 forms of LT in the Great Lakes but perhaps still 20 morphs of LT in Great Bear Lake.

E. Addison: *Is Lake Manitou the only lake with a large LT population on limestone in Ontario?* No, Charleston Lake and Devil Lake near Kingston support LT populations.

Bacher: *Does phosphorus in Lake Simcoe affect LT?* Yes, algal blooms promoted by phosphorus reduce the O^2 concentrations.

B. Falls: *Could the deep bellied LT in lake Superior just be the result of a big meal?* No, they are morphologically distinct. The siscowet LT in Lake Superior are so fat that they can go from great depths to the surface without swim bladder problems because the excess fat helps them adapt to the decompression accompanying changes in depth.

Obbard: *Would the Bell River that crossed the continent from SW to NE have warmed up?* Yes, it could have been warm on the edges; but it was a very large river.

Unidentified Guest: *Are bass a problem for LT?* Bass are eating a lot of the food of LT and have displaced them from the top of the food web to being deepwater planktivores, in no more than a few years. Rock bass have become the top predator of the warm water near shore environments.

Warren Dunlop thanked the speaker.

OBSERVATIONS

H. Juhola recommended two books. "The Eye of the Shoal: A Fishwatcher's Guide to Life, the Ocean and Everything" (Scales, Helen. 2018. – ISBN 1472936841) and "Man of the Trees: Richard St. Barbe Baker, The First Global Conservationist" (Hanley, Paul. 2018. – ISBN 978-0-88977-566-4).

H. Juhola mentioned that the Juholas annual Ontario canal trip cruise was cancelled due to extremely high water level in the Trent system. Many locks were not working until May 24.

H. Juhola had photos from a prior year taken by H. Lonsch of a house finch feeding its young in a nest on his balcony at 51 Alexander Street, Toronto. Nests were present at this site for a number of years but not this year.

Bertin reported that he had checked within the Toronto Harbour Commission Archives and that a Double-crested Cormorant was sighted off the Gibraltar Point lighthouse on July 2, 1834. This he expects may be the earliest record in print of the species in the GTA. In his 1900 Catalogue of Canadian Birds, John Macoun reported about the Double-crested Cormorant: "Breeds in numbers along the Atlantic coast and is of frequent occurrence in the Gulf and up the St. Lawrence and throughout Ontario, though we have no account of it breeding in that province."

Bertin also noted a report of cormorants in Nova Scotia in 1611, including in the *Jesuit Relations*. The latter is a fascinating document compiled by the Jesuit missionaries to New France between about 1609 and 1791 (the dates differ), that reported extensively on the ethnocultural heritage of the Native peoples and the natural history of Upper and Lower Canada. Bertin was especially interested in discussion of native eel-fishing in the St. Lawrence and Upper New York State. The local people would catch eels in fish weirs, smoke them and store them for later consumption, much as the B.C. Indians did with salmon. This provided a stable source of food, which had a huge impact on native culture and history. A searchable version of the Jesuit Relations is available online at http://moses.creighton.edu/kripke/jesuitrelations/relations_01.html.

Bertin spends time on Toronto's waterfront at installing white mooring buoys and floating white markers. On every visit over the past month, he observed a mute swan flying to a newly installed buoy and attempting to mate with it. It tries to climb on top, frequently arches his neck and puffs up his wings and feathers in typical mating behavior. (Photo by John King)

The meeting was adjourned at 8:48 P.M.

NEXT MEETING

The next meeting will be on 17 September, 2019.

The meeting was adjourned at 8:48 pm.

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