THE BRODIE CLUB

Established 1921

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

THE 1,075th MEETING OF THE BRODIE CLUB

The 1,075th meeting of the Brodie Club was held on Tuesday, 6 May, 2014 in Room 432 of the Ramsay Wright Laboratories of the University of Toronto.

Chair: Steve Varga
Secretary: Sandra Eadie

The meeting was called to order at 7:40 pm and was attended by 22; 20 members and 2 guests.

Roll Call:

Present: E. Addison, R. Addison, Bertin, Bryant, Coady, Daniels, Dunn, Eadie, A. Falls, B. Falls, D. Hussell, J. Hussell, Johnson, A. Juhola, H. Juhola, Reading, Riley, Tomlinson, Varga, Zoladeski

Guests: Dachin Frances (EEB Ph.D. student, guest of Johnson); Philip Cottrell (Zoladeski).

Regrets: Abraham, Boswell, Bousfield, Carley, Crins, Currie, Curry, Dunham, Iron, Lumsden, Machin, Martyn, Obbard, Pittaway, J. Rising, T. Rising, Seymour, Slessor

Minutes: Minutes of the previous meeting were accepted as circulated. Mix-ups over months in the minutes of the month before that were corrected in official copies archived on the website. Dunn apologized for any confusion that ensued (and has taken care not to specify any months in this paragraph).

Committee Reports:

Field Trip

Bryant reminded the group that the annual field trip will be June 15, 2014 to the Carden Alvar area. Details will be distributed. Bryant said that he is planning to scout out the places visited to ensure that the trip will run smoothly as possible.

Program:

B. Falls reminded members that the next meeting, which takes place September 16, will be members' night. Please contact him if you would like to present. The sooner the better to avoid a last-minute crunch! The committee will meet soon to plan 2014-2015 programs.

Ontario Nature

Last year the Brodie Club generously sponsored a student to attend the annual youth summit for biodiversity. Last month Curry asked members to do so again this year, with a suggested $10 per member. Those in attendance contributed $210. A further request this month netted more money. Since $300 is the total needed for a full sponsorship, it was proposed and unanimously approved that The Brodie Club treasury fill in any gap to $300.

Announcements:

Oliver Bertin said that there are many water birds in Toronto harbour and the island area right now. Members are invited to go out with him to see the action. He suggested calling a couple of days in advance of a desired trip, for up to three guests.

SPEAKER:


Chris Zoladeski, in basic and alternate plumage

Falls introduced member Chris Zoladeski, who is from Gdansk, Poland, where he received his undergraduate and master's degrees. In 1982, he received another M.Sc., in Forest Sciences, from Laval University in Quebec City. He earned his PhD on the phytosociology of the boreal forests of northwestern Ontario, under the late Dr. Paul Maycock of U of T's Erindale College.

Zoladeski is an environmental consultant. As an editor with the Field Botanists of Ontario he has helped beef up its newsletter considerably.

Zoladeski has traveled to eastern Asia (Korea, Primorye Region in Russia) and was struck by the similarities in flora and physiognomy between there and eastern North America.

"The Miocene Legacy: Phylogenetic and biogeographic affinities between the floras of Eastern North America and East Asia."

The catastrophic impact of the Yucatan asteroid 65 million of years ago marked the beginning of the Cenozoic Era. In the very warm climate of the Eocene Epoch (56 to 34 MYA), tropical and subtropical vegetation flourished up to the shores of the Arctic Ocean, which was a warm sea at the time. Cenozoic was the age of continued development of plants, especially the Angiosperms that ruled the Plant Kingdom.

The old floras of the Cenozoic reached their apogee during the Eocene epoch, underwent a transformation during the Oligocene cooling and again exploded in diversity during the Miocene (23 to 5 MYA). Vestiges of the great temperate forests from that epoch continue to live with us today.

The similarities between the two far-off regions of East Asia and Eastern North America were first (1750) noted by Linnaeus, the great developer of biological binomial nomenclature. His pupil, Carl Peter Thunberg, who had visited Japan, noted 20 species in common.

Asa Grey, the great American botanist, corresponded with Charles Darwin about the puzzling floristic similarities of the two areas, and they tried to explain the phenomenon. In Gray's "Statistics" paper, he initially listed 13 species in common. However, by 1859, he had had the opportunity to study and name the rich collections from Japan of Charles Wright, and the list of shared species grew to 134.

In the development of his explanation, Gray applied the reasoning of Joseph Dalton Hooker, who had recently advanced, in relation to southern-hemisphere taxa, "a hypothesis of all having been members of a once more extensive flora, which has been broken up by geological and climatic causes." With various refinements, this remains the leading theory today.


Jirisan N.P. mountain stream

Why are there so many similarities between the flora of Eastern North America and East Asia even though the two regions are far from each other? The speaker showed photos of similar scenes in the two areas. One would be hard-pressed to know where a photo of a brook flowing over stones in a dappled light forest was taken. Not only is the scenery similar but also there are many species and

genera in common despite the distance. Trees in common include birch, maple, oak, pine, ash, hickory, beech, tulip tree and many others.

East Asia has a very rich set of understory herbs and shrubs. The vegetation seems to grow and develop throughout the length of growing season, in contrast to North American forests where, after the spring outburst of flora, plant growth becomes much slower in the summer and essentially ceases in the fall. Asian plants are, indeed, much better adapted to shade, which could explain their success as invasives in American forests.

The flora of China is composed of many more species than the flora of the U.S., both at the genus and species levels, and both in gymnosperms and angiosperms - despite the roughly similar land mass of the countries. The flora of China alone includes 29,500 species, perhaps as many as 31,000, of which about 10,000 are endemic. This compares to about 20,000 native species in Canada and the US combined.

Among the many reasons for the richness of East Asian flora and vegetation are the proximity to the centres of origin and diversification of flowering plants, east-west and north-south floristic continuities, less severe glaciations, and geological complexities including the effects of the collision of the Indian subcontinent with the Asian continent during the Eocene.

Climatic changes during the Tertiary and Quaternary were very complex, especially during the late Tertiary. The transition from Eocene to Oligocene epochs (at 47-27 MYA) was one of the most dramatic episodes of climatic and biotic change since the demise of the dinosaurs. The mild tropical climates of middle Eocene were replaced by the beginning of modern climatic extremes, including formation of glacial ice in Antarctica.

During the Eocene, climates were warm enough to support tropical vegetation at high latitudes in the Northern Hemisphere. The existence of the Bering and North Atlantic land bridges facilitated exchanges of both temperate and tropical floristic elements. This permitted a free movement of newly evolved taxa and development of a large and diverse hemispheric flora.

The broad belt of land encircling the northern latitudes favoured the development of a rich and widespread flora dubbed the Arcto-Tertiary Geoflora. This flora reached its fullest expression in the Miocene Epoch, when the Temperate Broadleaf Deciduous Forest was dominant in the east, now separated from the west part of the continent by dry grasslands and savannas which formed as a result of the rain shadow caused by the emergence of the Rocky and Cordillera Mountains.

The disjunct species on the two continents strongly tend toward certain characteristics: (1) with a few exceptions, the plants grow in temperate, moist (mesic) forest environments; (2) most of the species are woody, broadleaf deciduous plants; (3) herbaceous species are typically perennial, spring blooming, early leafing ephemerals from rhizomes or tubers adapted to life on the shady forest floor, and (4) many of the disjunct plant families are relatively old from an evolutionary standpoint. Their flower structure (Ranalian complex) is more primitive than that of other flowering plants.

Prunus sp. Sobaeksan N.P.

Many examples of woody species common to the two areas were shown, including magnolia, Virginia creeper, dogwood, witch hazel, hickory, sassafras, sweet gum, honey locust, and spicebush. Herbaceous plants in common are sarsaparilla, lizards tail, trillium, ginseng, blue cohosh, lopseed and may-apple.

There were five major periods in which floristic exchanges between East Asia and Eastern North America were most likely to occur: Pre-Tertiary, early Eocene, late Eocene-Oligocene, Miocene, and the late Cenozoic periods. Many studies have confirmed that the major divergence times of the intercontinental disjuncts seem have been between 5-30 MYA.

The conclusion seems to be that the commonalities developed mostly during the Miocene, during the time when East Asia and North America were still joined by the Bering land bridge. A colder climate, repeated glaciations and severing of land connections broke the link. The direction of species migrations was mostly from Asia to North America, less so from North America to Asia except for the conifers, which mostly dispersed from North America to Asia. However, although very important, Asia was not the sole source of origin of the old geofloras of the Cenozoic; current theory assumes a diffuse, multi-centred origin.

QUESTIONS:

Discussion was exceptionally lengthy and varied, with a focus on evolutionary processes.

Riley: Wondered why our trees here are so sensitive to invasive threats. Is it that in Asia there is much more diversity among families of trees? There are more species of maples in Asia. Are our sugar maples in danger? Does diversity help protect against invasion? Perhaps more species make self-immunization a better possibility. For example, oaks, of which there are many species in eastern North America, do not appear to be threatened, and there are also a lot of oaks in Southern China. There was general discussion on these points.

Dunn: Major divergence between closely-related species in the 2 areas was in the Miocene, which implies isolation, but the major migration was also then -- how might that occur? This triggered general discussion of differentiation (local adaptation) happening during range expansion, and potential sympatric evolution. Zoladeski noted that new methods of paleobiology and molecular genetics have created a new taxonomy that can tell when splits occurred.

Bertin: Mentioned that some fish species also have disjunct distribution that probably resulted from extirpation in the central part of a once continuous range – e.g. Red Sucker in Yukon and Eastern North America.

Bryant: Does the East Asian flora have the same fall colours and spring ephemerals, that we see in eastern North America? He did not see many spring ephemerals in China when he was there. Perhaps this is because the soils are different? Zoladeski saw an explosion of colours near Vladivostok in the fall.

B. Falls: Many of the shared plants are woody – was the Bering Strait forested? Yes, during most of Cenozoic. Asked about ferns, Zoladeski said there were several ferns, such as Maidenhair, in common as well. Bruce: were most similarities at generic, rather than species, level? Yes, and at family level, too. The species look similar because they are so recently split.

Tomlinson said it is hard to get Chinese plants to succeed here. He thinks soil is probably the main reason, since climate is very similar. After hearing this talk, he professed to being less worried about invasive species – in the long run, it all works out.

Daniels: Might the imbalanced origin of shared species over the vector of the Bering Land Bridge be related to the Coriolis effect, making northern hemisphere air circulation go from west to east? Much discussion followed on transport mechanisms, with E. Addison even touching on the great rubber duckie voyage (see here). Johnson noted that a more important factor in the directionality of migration might be

differences in community stability. With greater rates of extinction in mountains, lower overall species diversity, possibly greater seasonality, etc., migrants might be more likely to find open niches and be able to persist. Certainly the rate of recent diversification has been much greater in North America.

Coady: Animals are known to move seeds in some cases. For example, the Eskimo Curlew carried crowberry to Argentina, where the plant now thrives even though the Curlew is gone. No one has yet done genetic studies to see if the Argentinian crowberry has differentiated. Coady also cited juncos as an example of rapid diversification in new area. This is an old group in Central America, but there has been lots of diversification in North America, including a population that started breeding in its San Diego wintering area 30 yrs ago and is now genetically distinguishable from the parent group. Can things happen that fast in plants? The answer from several was 'yes.' Riley noted that along shorelines (St. Laurence since last glaciation, James Bay), special taxa have shown up. Little genetic work has been done so far, but there appears to have been fast differentiation in the newly-open, often disturbed niches. Johnson noted that some of the first examples of rapid evolution were from plants.

Varga thanked the speaker, sharing stories of his and the speaker's experiences of the extreme measures taken by their admired but frugal professor, the late Dr. Paul Maycock, to keep costs of field trips low. There was always a search for campsites where fees could be avoided, such as parks used only at night when the pay booth was closed, or camping on road verges.

OBSERVATIONS:

Tomlinson observed mouse damage on trees over winter. Damage was severe at the base of trees, beneath the snow cover. An icy surface, which the mice could not breach, protected bark above the snow.

Daniels mentioned that the Redwing Blackbird is a bit later than usual. However, his last six Juncos left on 6 May, right on time. Reptiles are very late this year.

Bryant said that migrants are a week behind this year. He was encouraged to hear a House Finch singing on Harbord St.

Dunn noted that at Long Point on 6 May, ca. 9 warbler species, orioles, grosbeaks and some flycatchers were starting to come in, and in another week they should be all over.

D. Hussell heard from a contact in Iqaluit that Northern Wheatears have arrived, 6 days earlier than in his previous records, although still below freezing there. He has wondered whether climate warming in Europe might cause the birds to migrate early from there and hit cold weather in North America.

Coady has a new animal for his yard list at Thickson's Woods: a river otter swimming in Lake Ontario.

Mink have destroyed the Common Tern nesting colonies on rafts at Leslie Spit for the past two years. This year, high rims will be erected around the rafts to stop the predation.

ADJOURNMENT:
The meeting was adjourned at 9:35 p.m.

NEXT MEETING:
The next meeting will be held Tuesday, 16 September at 7:30 pm in Room 432 of the Ramsay Wright Zoological Laboratories.

CORRESPONDENCE

Twenty-five years ago: In May of 1989, Ian Fleming spoke to the Club on Reproductive ecology of Pacific salmon.

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