The 865th meeting will be held in the Faunal Lab - Tues. Feb. 19th - 8:00 PM
SPEAKER: Corresponding member Dr. Ed Crossman
SUBJECT: BUILDING THE FISH COLLECTION AT THE ROYAL ONTARIO MUSEUM

MINUTES OF THE 864th MEETING

864th MEETING OF THE BRODIE CLUB WAS HELD IN THE FAUNAL LAB, BORDEN BUILDING U.of T. ON JAN. 15, 1991 at 8:00 P.M.

There were 13 members, 3 guests and 1 corresponding member present.
Greg Warchol was the guest of Savage - Ross Goudie, guest of Auger - Don Huff, guest of Martin.
Norm Martin was Chairman, Carrick - Recording Secretary
The Minutes of the 863rd meeting were read by Bodsworth and approved.

ANNOUNCEMENTS: Martin reported on the FON, Wye Marsh and sponsorship of nature classes.

SPEAKER: The speaker was member Bill Crins whose presentation on Tarweeds is attached.

After questions and discussions the speaker was thanked by the chairman.

MEMBERS OBSERVATIONS:

LENNOX: Wintering Herring Gulls and Black-Backed Gulls. Cougars in the Maritimes.

LUMSDEN: Current status of Trumpeter Swan re-introductions

HUSSEL: Close observations of a Sharp-shinned Hawk killing and eating a Starling at Aurora.

TASKER: Introduction of Turkeys, Screech Owl calling - 5:30 A.M., vicinity of Bloor and Yonge

BOISSONEAU: Census through playback of recorded bird calls.

SPEAKMAN: Black-backed Gulls at Lake Simcoe.

SAVAGE: Further thanks for speaker
Pika bone from Alba Cave - second Ontario record

WARCHOL: Spiders, Salamanders and Fish in caves.

BODSWORTH: Toronto bird count - 33 Mutes - no Trumpeters
Mew Gull at Sunnyside and Grenadier Pond

HUFF: Sightings of Cougar

MARTIN: Timber management hearings - Monday thru Thursday - 151 Bloor St. W. - 10th floor

CRINNS: 70 Glaucus Gulls at Woodlands Cemetery Hamilton, few winter Finches, Hawk Owl at Arnprior.

MEETING ADJOURNED at 10:30 P.M.

The talk presented by Bill Crins was entitled, "Flavonoid Chemistry and Evolution in the Tarweeds". This work was conducted while Bill was a post-doctoral fellow with Bruce Bohm at the University of British Columbia. Among the other collaborators on this project was Gerry Carr of the University of Hawaii.

The talk began with an introduction to the tarweeds, followed by a brief review of the nature, variation patterns, and general distribution of flavonoid compounds within the tarweeds. Tarweeds comprise a distinct subtribe within the sunflower tribe of the aster family (Madiinae: Heliantheae: Asteraceae). There are approximately 100 species in 15 genera, distributed in two regions: 1) the west coast of North America from Baja California to central B.C.; 2) the Hawaiian Islands. To provide a context for the tarweeds, a number of more familiar relatives were shown, including the cultivated sunflower, black-eyed Susan, coneflower, balsamroot, and goldfields.

The tarweeds possess such a diverse array of ecological, cytological, morphological, chemical, and physiological specializations that Crins characterized them as the "Darwin's finches" of the plant world. This diversity provides an ideal system for the study of evolutionary divergence. In the case of the work done by Crins and Bohm, flavonoids were used to track this divergence. It was explained that flavonoid molecules (two phenolic rings joined by a heterocylic ring) are easy to work with, being relatively easily extracted, stored, and chemically characterized.

Chemical divergence has occurred in several different directions in the tarweeds. In the case of some species of tidy-tips (Layia spp.), certain groups of compounds have been lost with evolutionary advancement. In the case of the Hawaiian genus Dubautia, there is a clear trend toward increasing chemical complexity as new species have evolved. This trend in chemical change is also correlated with changes in chromosome numbers, ecological preferences, morphology, and geological age of the various islands in the chain. Several species of Dubautia were shown to illustrate the morphological variation found in this genus. A diagram of hypothetical evolutionary relationships among certain species of Dubautia was shown.

Another example from Dubautia was used to illustrate the utility of both vacuolar flavonoids (glycosides) and external, secreted flavonoids (aglycones) in tracking evolutionary processes on a finer scale. Natural hybrids between D. scabra and D. glutinosa on the island of Hawaii were found to contain differing arrays of aglycones, and also to possess a mixture of parental glycosides in addition to some novel compounds. The evidence suggests that the hybrids are not uniform, but appear to consist of several backcrossing generations, with introgression occurring toward the glandular parent (D. glutinosa).

Following the discussion of the utility of flavonoids in tracking evolution in the Hawaiian tarweeds, several North American (mainly Californian) examples were presented.

Flavonoid aglycones were used to illustrate the variation that occurs within a morphological species, in Calycadenia ciliosa. Populations were found to differ in the compounds accumulated within their glandular resins, and the distributions of these compounds correlated with known chromosomal rearrangements.

Flavonoid aglycone data obtained by another group of systematists in California, from the genus Hemizonia, was re-examined in an evolutionary context, by considering the biosynthetic pathways by which the compounds could have been produced. It was found that major groupings of species could be recognized using this method. However, the determination of fine-scale relationships was not possible using this data set.

The small Californian genus Holocarpha was studied to determine if chemical changes were correlated with changes in other character systems during the evolutionary process. Biosynthetic pathways were again applied to flavonoid aglycones produced by the species of this genus. Cladograms or evolutionary trees based on morphological and cytological characters were also produced for this genus. The chemical data were then compared to these evolutionary trees. The chemical characters appear to be somewhat more labile than the other character types; that is, biosynthetic pathways in this genus are subject to higher levels of change than are morphological and cytological characters. The character systems are not fully congruent.

Although a number of genera have now been examined with regard to flavonoid occurrence and variation, there are still major gaps in our knowledge. Some of the larger genera of tarweeds, such as Madia and Calycadenia, still require basic investigation before evolutionary hypotheses within these genera can be advanced. The functional significance of flavonoids is also poorly known. These compounds may serve as UV screens, or feeding deterrants against insects. Different mixtures of compounds may provide protection against different herbivores. The tarweeds provide fertile ground for continuing investigations into the chemical basis of evolutionary processes.